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OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK
FOCUSED FEASIBILITY STUDY FOR
REMEDIATION OF SOILS CONTAINING
AROCLOR 1248

Prepared for

Occidental Chemical Corporation

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OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
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SUMMARY

The Hooker Chemical/Ruco Polymer Corporation site (Hooker/Ruco) is on the National Priorities List under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) program. Any program or action to address site conditions at a CERCLA site should be selected based on a Feasibility Study (FS). The site is currently the subject of a Remedial Investigation/Feasibility Study (RI/FS) and a final record of decision for the site will await completion of the RI/FS. One of the areas of environmental concern at this site is soil containing polychlorinated biphenyls (PCB's) (Aroclor 1248) present as a result of a Therminol spill, adjacent to the pilot plant. The Hicksville Pilot Plant's Therminol system used Aroclor Therminol between 1946 and 1978. The Therminol system was retrofitted and converted to a non-Aroclor Therminol, Therminol 66, prior to August 1978. The extent of the spill has been defined by previous studies.

Occidental Chemical Corporation (OCC) wishes to expedite the remediation of this soil. Therefore, this Focused Feasibility Study (FFS) has been completed to address this PCB presence in soil.

The FFS has examined proven, as well as emergent technologies, and narrows the options to 14 remedial alternatives. All onsite options involving treatment would cause

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significant interruptions of an active plant which is not owned or controlled by OCC. Community acceptance of onsite remediation is unknown at this time.

The retained offsite alternatives achieve similar levels of effectiveness by reducing the PCB volume and potential exposure in the affected one-half acre in the central portion of the site. The results of the offsite options permanently remove all soils containing PCB's in excess of 10 or 25 ppm (parts per million). The offsite options are landfilling or incineration, the implementability and effectiveness of offsite incineration, however, would result in a disproportionate increase in the remedial cost. The cost for offsite incineration and land disposal of resulting ash is estimated to be between $2,190,000 and $3,300,000 versus the cost for land disposal alone, which would range between $670,000 to $918,000. Because both offsite remedial alternatives provide comparable remedial solutions, cost balancing criteria favor the selection of offsite land disposal as the remedy.

1.0 INTRODUCTION

In October 1984, the United States Environmental Protection Agency (EPA) added the Hooker/Ruco site in Hicksville, New York (figure 1) to the National Priorities List. Accordingly, the site has been evaluated with respect to the areas of applicable environmental concern. One area of concern is a Therminol spill which has been selected for remediation and is located in the central portion of the site (figure 2). The one-half acre area has been shown to be underlain by soil containing PCB's resulting from past facility activities. In accordance with EPA guidance, this area of environmental concern has been designated an Operable Unit (OU).

This Source Control OU/FFS is intended to identify, describe and evaluate permanent solutions using alternate technologies to the maximum extent practical to reduce the volume, mobility and toxicity of PCB's at the site. This study identifies the response objectives and screening criteria for the selection of the appropriate remediation of PCB soil at the site. Consequently, the technologies and remedial alternatives are evaluated with respect to meeting the objective of source control, in accordance with Federal and State laws including the National Contingency Plan (NCP) and the Superfund Amendments and Reauthorization Act (SARA).

All proven and emergent technologies have been screened and either retained or eliminated from further consideration on the basis of technical implementability. Following the technology screening, the retained process options have been combined to form remedial alternatives with respect to three different PCB concentration cleanup levels; 500 ppm, 25 ppm and 10 ppm, and the four individual subunits (the direct spill area, transport related areas, the excavated soils and the impacted recharge basin). Relative to a 2 ppm cleanup standard, current EPA guidance takes into account the very low mobility of PCB's which "warrants waiving many of the chemical waste landfill requirements under scenarios where

1.0 INTRODUCTION

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All proven and emergent technologies have been screened and either retained or eliminated from further consideration on the basis of technical implementability. Following the technology screening, the retained process options have been combined to form remedial alternatives with respect to three different PCB concentration cleanup levels; 500 ppm, 25 ppm and 10 ppm, and the four individual subunits (the direct spill area, transport related areas, the excavated soils and the impacted recharge basin). The initial remedial alternatives have been classified, with respect to four categories: 1) no-action; 2) in-situ containment; 3) onsite actions; and 4) offsite actions. These alternatives have been initially screened based upon effectiveness, implementability and cost.

Following the initial remedial alternative screening process, the retained alternatives have been combined to present the most cost-effective methods for remediating the site as a whole. Fourteen alternatives, grouped into 1) no-action; 2) in-situ containment; 3) alternatives with a cleanup level of 25 ppm; and 4) cleanup with a level of 10 ppm; have been developed and screened in detail, with respect to nine criteria. The process option screening criteria, the nine evaluation criteria and the role of each criteria in the decision making process are presented in table 1-1.

Two criteria, protection of human health and the environment and compliance with the ARAR's are fundamental requirements that have to be met in order for the remedial alternative to be eligible for selection. They are described as threshold factors.

The five primary balancing criteria are long-term effectiveness and permanence, reduction of the toxicity, volume or mobility through treatment, short-term effectiveness, implementability and cost. The balancing criteria allow for an evaluation of each alternatives merits and deficiencies. The balancing criteria are the primary factors upon which the analysis of each alternative is based.

A preliminary assessment of State and community acceptance is made and technical input from either the local agency or community may require further modifications to the retained alternatives.

1.1 Background

The site is an active manufacturing facility located in Hicksville, New York (Long Island) operated by Ruco Polymer Corporation. The immediate surrounding area consists primarily of land used for industrial and commercial purposes. The local topography generally slopes gently towards the south.

Apparently, periodic discharges of PCB Therminol had occurred adjacent to the pilot plant and had reportedly affected an area about six feet square. Subsequent investigations revealed that, while only a relatively small area has been affected below the surface soils, the PCB's have been spread over a larger area. This is presumably a result of surface-water runoff, sediment transport and truck traffic. The PCB's have migrated along a ditch and into a storm-water recharge basin and were present in soils excavated during a tank removal program adjacent to the pilot plant undertaken by Ruco.

In general, soil contamination is shallow and limited to the one-foot soil horizon. Soils in the vicinity of the discharge source, however, contain concentrations in excess of 1,000 ppm and PCB's have penetrated the soils to a depth of 10 feet below grade, but at decreasing concentrations with increasing depth. All of the analytical data generated to date, including QA/QC data, have been presented to EPA Region II. Table 1-2 presents a list of reports which contain all soil-quality data and laboratory reports. The data were reviewed for QA/QC acceptability by OCC personnel. The data include information on the spill area obtained during the RI.

The extent of the occurrence has been defined through soil sampling and analysis conducted in phases from June 1983 to October 1989. The volume of soil containing with PCB's in excess of 25 ppm is estimated at 700 cubic yards (875 tons). The volume of soils containing PCB's in excess of 10 ppm is approximately 1,110 cubic yards. Insufficient data exist to fully quantify the volume of soil containing PCB's in excess of 2 ppm. Plate 1 presents the concentrations of PCB's in the soils at the Hooker/Ruco site. Plates 2 and 3 show the extent (horizontal and vertical) of PCB's in the soil which exceed the 25 ppm and 10 ppm levels, respectively.

The geology of the site is characterized by unconsolidated sediments (approximately 1,200 feet thick), which exhibit a moderate to high permeability in the upper 50 to 100 feet. The local depth to ground water generally occurs below 50 feet. PCB's have never been detected in ground water at the site. The affected material consists of medium to coarse sand, gravel and cobbles. The OU is underlain by a complex of utilities, shown on plate 4.

1.2 Purpose

In accordance with SARA, this FS has reviewed potential remedial alternatives that meet or exceed the ARAR's. The ARAR's are established requirements that should be met to assure cleanup levels that will protect public health and the environment. The remedial alternatives reviewed as part of this FFS were assessed with respect to a target cleanup level that exceeds the 10^{-4} to 10^{-6} cancer risk values. This risk range corresponds to a 25 ppm concentration of PCB's in the soils.

The FFS identified and screened potential remedial measures with respect to their ability to achieve this risk-based cleanup level.

2.0 IDENTIFICATION OF ARAR's

2.1 Remedial Action Criteria

The remedial actions applicable to SARA must comply with requirements or standards under Federal and State environmental laws. The requirements that must be complied with are those that are legally applicable or relevant and appropriate to the substance or the circumstances of the release. The EPA does not currently make available a guidance document that identifies these potential ARAR's (Federal Register, 1987). Interim guidelines provided by the EPA to define the nature, scope and use of the ARAR's are:

- <u>Applicable requirements</u>. These pertain to those cleanup standards which specifically address a contaminant, remedial action, location or other circumstances at a Superfund site.
- <u>Relevant and appropriate requirements</u>. These pertain to those standards, criteria or limitations addressing problems or situations sufficiently similar to those encountered at other Superfund sites. For example, RCRA regulations for capping a waste may be considered relevant and appropriate.

ARAR's are site-specific and must be determined accordingly. Therefore, ARAR's are generally identified and incorporated as the RI/FS progresses. Where there are no specific ARAR's for a chemical or given situation, a public health evaluation (PHE) is used to develop risk-based cleanup criteria. The PHE determines whether the existing air, soil and ground-water concentrations at a site pose a public health risk.

ARAR's can be identified with respect to three general categories:

- Chemical specific. These requirements are usually health or risk-based numbers limiting the concentration or amount of a chemical that may be discharged into the ambient environment. They are independent of the location of the discharge, but may be related to the intended use of the environmental medium.
- Location specific. These restrictions are generally placed upon chemical concentrations or releases, or upon conduct of activities, solely because they are in a particular location.
- Action specific. These ARAR's are contingent upon the remedial actions selected for the site. They are based upon the implementation of particular technologies or actions.

For the purpose of this review, chemical and location specific requirements are grouped together as ARAR's affecting selection of cleanup levels. Action specific ARAR's are considered separately as those potentially affecting implementation of remedial actions.

If chemical specific standards or guidelines for remedial action have not been established under State or Federal statutes for contaminants found at a hazardous waste site, then "To Be Considered" (TBC) criteria are used. The NCP permits the use of TBC's for guidance purposes to protect public health and the environment. Non-promulgated advisories or guidance documents issued by State or Federal governments do not have potential ARAR's status. However, they may be considered in determining an appropriate protective remedy. The three approaches to determining relevant cleanup levels are:

1. Cleanup to Background

This approach should only be applied to naturally occurring compounds (e.g., metals). Consequently, the cleanup level for manmade compounds would be "zero" or the minimum detection limit of the analytical method in use.

2. Cleanup to Analytical Detection Limits

The Contract Laboratory Protocol contract-required detection limit for Aroclor 1248 is 80 ug/kg (micrograms per kilograms) in soil.

3. Cleanup to Levels Set by Risk Assessment Methodology

This approach is generally used by regulatory agencies to set standards and criteria for contaminants in the environment. There do not appear to be any applicable standards for spills of PCB's which occurred prior to the effective date of the TSCA spill policy on May 4, 1988. *The Federal Register, Volume 52, No. 63,* April 2, 1987, states that the EPA will determine the cleanup standard on a case-by-case basis.

2.2 ARAR's and TBC Criteria

ARAR's and TBC criteria affecting the selection of alternatives for the remediation of the OU are presented with respect to the PCB soil.

2.2.1 TSCA

The TSCA, promulgated in 1976 and with an effective date of February 17, 1978, requires the regulation and disposal of all PCB's that have entered the environment if the source of contamination prior to the spill contained concentrations of 50 ppm or greater PCB's.

Under the TSCA, a spill is defined as a leak or other uncontrolled discharge. The PCB's detected at the Hooker/ Ruco site were introduced by an accidental release. Based on site specific information, it is unclear whether there was a release of PCB's after February 17, 1978. Because of this uncertainty we will treat TSCA as a TBC criteria.

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2.2.1.1 TSCA PCB Spill Cleanup Policy

The effective date of the TSCA spill policy for the cleanup of PCB's established by the EPA, is May 4, 1988. The TSCA policy outlines the measures which EPA considers to be adequate for the majority of situations where PCB contamination occurs during activities regulated under the TSCA. This policy does not apply to spills that occurred before the effective date of the policy or to actions being taken under environmental statutes other than TSCA (e.g., CERCLA) such as the Hooker/Ruco site. The cleanup levels stated in the TSCA spill cleanup policy are TBC's, but can be considered at the site in the absence of other Federal or State regulations.

The TSCA policy established requirements for cleaning spills in restricted access areas. The OU is classified as a restricted access area because it is more than 0.1 km (kilometer) from a residential or commercial area. The policy would require a cleanup level of 25 ppm PCB's and a deed restriction for industrial use.

The 25 ppm cleanup value would require at a minimum, a radial area of 0.1 km surrounding the OU to be deed restricted for industrial use. A 10 ppm cleanup level would provide for unrestricted future land use.

2.2.1.2 PCB Disposal and Treatment Requirements

Regulations promulgated under TSCA state that non-liquid mediums that are contaminated with PCB's at concentrations in excess of 50 ppm must be incinerated, treated by a method equivalent to incineration or be disposed of in a chemical waste landfill as described in 40 CFR 761.75 (40 CFR Section 765.60 (a) (4)). These requirements are applicable to the OU potential cleanup options and are, therefore, considered ARAR's.

At several CERCLA sites, the EPA has required soils containing over 500 ppm PCB's to be incinerated. The TSCA policy for PCB disposal and treatment requirements, however, does not mandate additional treatment of non-liquid PCB waste in excess of 500 ppm. At EPA's request, additional treatment of solid PCB waste in excess of 500 ppm is classified as TBC.

2.2.1.3 Summary of ARAR's

Table 2-1 presents a summary of Federal and State statutes covering treatment, transportation and disposal of PCB's.

3.0 IDENTIFICATION AND INITIAL SCREENING OF TECHNOLOGIES

3.1 Screening Criteria

The screening of remedial technologies is performed to identify an adequate number of alternatives which achieve effective reliable solutions that maintain protection of human health and the environment over time and that minimize the untreated waste. These technologies are then assembled into remedial alternatives. Technologies are screened using four criteria:

- applicability;
- effectiveness;
- implementability; and
- reliability.

Technologies that only provide partial treatment, but can be combined with other reliable technologies to provide effective remediation were also retained for further screening.

Another factor at this site is the applicability of the technology to each subset of the problem. Because of the nature of the spill and the active use of the site, four subsets have been identified as follows:

- direct spill area: this is the area within which the upsets occurred and is characterized by soils that contain PCB's in excess of 1,000 ppm or by occurrences which have significant concentrations which have penetrated below the upper foot of soil;
- transport-related areas: these areas are characterized by shallow, relatively low-level occurrences caused by truck traffic or surface-water runoff;
- recharge basin: these are characterized by the sediments in the bottom of the recharge basin (treated separately because of the functional

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nature of the facility and the restricted access). This recharge basin is an active, SPDES-permitted discharge point.

- excavated soils: as part of a tank removal program, Ruco excavated and stockpiled about 70 cubic yards of soils containing PCB's. These remain onsite covered with plastic.

3.2 Identification of Alternatives

Table 3-1 lists all of the technologies identified in the literature for treatment of PCB's or soils containing PCB's. The table also provides a brief description of the processes. Many of the technologies are not available commercially; others would only be implementable on a cost-effective basis if the volumes of material involved were significant.

Field demonstration of unproven technologies might be necessary, which could utilize much of the waste material, yet not be approved. Some technologies also require test burns or pilot tests, which also would utilize a significant percentage of the waste. Alternate or emergent technologies are used primarily at sites containing thousands of yards of material.

Review of completed Records of Decision (ROD's) for Superfund sites, where the primary hazardous substance was PCB's, documented that volume was an integral factor in determining remedial treatment. Sites that contain greater than 10,000 cubic yards of contaminated material were primarily treated onsite utilizing a proven or emergent technology. Sites where the volume of contaminated sediment was less than 10,000 cubic yards showed a preference for offsite remedial treatment. The ROD's establish that onsite alternative treatment of low-volume contaminated wastes do not offer additional protection to human health and the environment in relation to cost.

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Site constraints cause elimination of a number of technologies. Such constraints include underground utilities, vehicular and pedestrian traffic, soils characterized as rapidly permeable overlying an aquifer, the need to maintain a permeable condition in the recharge basin and ownership of the site by a corporation other than OCC.

Table 3-2 is a list of the feasible technologies which remain after initial screening. These alternatives are developed further in Section 4.0.

4.0 INITIAL SCREENING OF REMEDIAL ALTERNATIVES

4.1 Introduction

The initial screening of remedial alternatives is designed to narrow the list of potential remedial alternatives prior to a detailed analysis. The most promising available and emergent technologies, retained after screening in Section 3.0, have been applied to each of the four subunits at the Hooker/Ruco site. In addition, three PCB concentrations have been identified and include:

- soils containing PCB's in excess of 500 ppm (the direct spill area)
- soils containing PCB's in excess of 25 ppm (the direct spill area, transport related areas, excavated soils and the recharge basin soils)
- soils containing PCB's in excess of 10 ppm (the direct spill area, transport related areas, excavated soils and the recharge basin soils)

As required, in conformance with the NCP, both the no-action and containment alternatives have been retained and are also evaluated in detail.

4.2 Evaluation Criteria

The assembled remedial alternatives, separated by subunit and concentration, have been screened using three general criteria:

- effectiveness
- implementability
- cost

Table 4-1 presents the remedial alternatives that address a cleanup level of 500 ppm. The only applicable subunit with this concentration is the direct spill area.

The onsite and offsite remedial alternatives appear to be equally capable of fulfilling the treatment requirements for the impacted soils in the direct spill area. Onsite alternatives will require provisions for onsite set-up of either bioreactors or a mobile rotary kiln incinerator. The most substantial difference between onsite and offsite alternatives, however is the cost. Because of the limited volume of soil impacted with PCB's in excess of 500 ppm, 43 tons, onsite options for only this waste are not judged to be cost effective.

Table 4-2 presents the remedial alternatives that address a cleanup level of either 10 or 25 ppm. Each remedial alternative has been applied to the transport related areas, excavated soils and recharge basin soils. Comments addressing the direct spill area (table 4-1) although not included in table 4-2, would be applicable.

Both the onsite and offsite remedial alternatives appear to be equally capable of fulfilling the treatment requirements for the impacted soils in each of the subunits. As with the direct spill area, all onsite alternatives would require provisions for set-up of onsite equipment. Cost is the major difference between the remedial alternatives.

As a result of the initial screening, all onsite remedial alternatives are not judged to be cost effective, because of the small volume of impacted soils in each subunit. For this reason, Section 5.0 of the FFS report combines the individual subunits into cost-effective remedial alternatives for the site as a whole. The remedial alternatives are categorized into two cleanup goals based upon PCB concentrations, of 25 and 10 ppm. As required, in conformance with the NCP, both the no-action and containment alternatives are retained and developed in detail.

5.0 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

Section 2.0 of this report established the objectives of the FFS and identified ARAR's and the proposed risk based cleanup guideline of 10 or 25 ppm for soil containing PCB's at the OU. Section 3.0 identified and screened available and emergent technologies for remediation of PCB's in soil. This section contains descriptions of retained alternatives that address the PCB soils at the site in conformance with the NCP requirements under SARA. Scenarios are considered that would consist of more than one technology for addressing the previously-identified subunits of soil.

Fourteen alternatives are presented in this section which have been organized into four categories, based upon PCB concentrations and selected cleanup spills.

Category I - No action.
Category II - Soil containment with little or no treatment.
Category III - Alternatives that contain treatment or disposal as a major component; with a clean-up level of 25 ppm.
Category IV - Alternatives that contain treatment or disposal as a major component; with a clean-up level of 10 ppm.

The following is a summary of the remedial action alternatives selected for the Hooker/Ruco site.

5.1 <u>Category I - No Action</u>

Under this section, the areas which have exposed soils containing PCB's would be fenced off to limit access, thus reducing human exposure. A six-foot high chain-link fence would be installed to prevent unauthorized access and prevent human contact with the contaminated soils. The fencing would extend approximately 1,500 linear feet, and encompass the pilot plant and Sump No. 3. Deed restrictions would be obtained to avoid disturbance of the soils in the future. Long-term surface runoff, ground-water, and air monitoring programs would be implemented to assess the environmental risks and identify potential receptors. Monitoring samples would be collected quarterly and an annual report would be completed. Monitoring would continue for 30 years following site closure. This alternative would essentially leave the site in its present condition.

5.2 Category II - In-Situ Containment

This method would consist of paving all soils which contain PCB's in excess of 10 ppm in the direct spill area and transport related areas. Approximately 7,700 square feet of area would require paving. Twelve inches of clean fill would be placed and compacted over the targeted area, followed by 3 inches of asphalt on top of the bedding material. Deed restrictions would be obtained to avoid distribution of the soils in the future. Long-term inspection of the containment structure would be required.

Containment of the PCB soils does not address the already excavated soils or the recharge basin sediments. Approximately 70 cubic yards of soil have been excavated by Ruco. This waste is stockpiled east of the pilot plant and is stored on and covered with plastic. The excavated soil has been removed from its in-situ status, and redisposition would require that the site conform to the requirements of a TSCA chemical waste landfill described in 40 CFR 761.64 and at a minimum, involve future evaluation of the site every five years to ensure protection of human health and the environment. The recharge basin is an active SPDES - permitted discharge point and paving would destroy the functional nature of the basin. The recharge basin could be filled with the excavated soil and capped similar to the transport related areas. A new recharge basin would be constructed to replace the existing one.

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5.3 Category III

Six remedial alternatives have been identified that provide treatment of the PCB soils/sediment to cleanup level of 25 ppm.

5.3.1 Offsite Landfill

This alternative involves excavating all soils and sediment that contain PCB's in excess of 25 ppm, approximately 700 cubic yards. Initial excavations would be made to the footing depths adjacent to the pilot plant and then sloped away from the building. Steel sheet piling will be installed in the direct spill area and soil material will be excavated to the final depth. The excavated area would be backfilled with clean fill and the PCB soils/sediment would be transported and disposed of at a prevent TSCA chemical waste landfill. Soils containing greater than 10 ppm would be paved with an asphalt cap to prevent human exposure. Deed restrictions, up to 0.1 km surrounding the spill area, would be obtained to maintain the adjacent property as an industrial restricted area. Long-term inspection of the capped area would be completed to ensure protection of human health and the environment.

5.3.2 Offsite Landfilling and Offsite Thermal Destruction of Soils Containing PCB's in Excess of 500 ppm.

This alternative would include all of the same procedures as Alternative 4.3.1, but in addition, soil containing PCB's in excess of 500 ppm, would be transported to a permitted Annex I incinerator and the waste would be burned off. Approximately 36 cubic yards of material in excess of 500 ppm will require additional treatment.

5.3.3 Onsite Bioremediation

Onsite bioremediation commercially available through Detox, Inc. of Sugarland, Texas. Onsite bioremediation would be completed in a series of steps. Leach beds would be constructed at the site, and the leach beds would be lined and equipped with underdrains. All soil and sediment that contain PCB's in excess of 25 ppm would be excavated and placed on the leaching beds. The excavated soils/sediments would be washed with detergents and the leachate would be collected. The leachate would be introduced into a bioreactor and the leached soil would then be fed into the bioreactor.

Soils containing greater than 10 ppm would be paved with an asphalt cap and long-term inspection of the containment system would be required to ensure continued protection of human health and the environment. Deed restrictions, up to 0.1 km surrounding the impacted areas, would also be obtained to maintain the industrial restricted status of the operable unit.

5.3.4 Onsite Bioremediation and Offsite Thermal Destruction of Soils which Contain PCB's in Excess of 500 ppm.

This alternative would include all of the same procedures as Alternative 4.3.3, but would provide for soil containing PCB's in excess of 500 ppm, to be segregated during excavation activities. The segregated soils would be transported to a permitted Annex I incinerator and the waste would be thermally destroyed. Approximately 36 cubic yards of soil will require thermal destruction.

This alternative would expedite the bioremediation process by limiting the concentration of soil containing PCB's at 500 ppm.

5.3.5 Onsite Incineration

A mobile incinerator is available for commercial applications through Thermodynamics Corporation of Bedford Hills, New York. The process is described fully in their literature, which is presented in the Appendix. Soil containing PCB's in excess of 25 ppm would be excavated, incinerated and the ash would be returned to the excavation. However, the soil, even if incinerated, may have to be

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treated as hazardous waste, unless redisposition of treated material will not be considered disposal, pursuant to RCRA as proposed for CERCLA sites, (Federal Register Vol. 54, No. 194, PG. 41566; October 10, 1989).

Soil containing greater than 10 ppm would be paved with an asphalt cap and long-term routine inspections of the containment system would be required to ensure continued protection of human health and the environment. Deed restrictions, up to 0.1 km surrounding the impacted areas, would also be obtained to maintain the industrial restricted status of the operable unit.

5.3.6 Offsite Incineration

This technology would involve excavation of all soils in excess of 25 ppm and replacement with clean fill. The excavated soil would be transported to a permitted Annex I incinerator and the waste would be thermally destroyed. Further treatment of the residual ash following thermal destruction may be required if the waste ash still contains hazardous components. Because the residual ash from thermal destruction often requires additional treatment prior to disposal, offsite thermal destruction is primarily employed for liquid wastes.

Soil containing greater than 10 ppm would be paved with an asphalt cap and long-term routine inspections of the containment system would be required to ensure continued protection of human health and the environment. Deed restrictions, up to 0.1 km surrounding the impacted areas, would also be obtained to maintain the industrial restricted status of the operable unit.

5.4 Category IV

Six remedial alternatives have been identified that provide treatment of the PCB soils/sediment; with a cleanup criteria of 10 ppm. The technologies in Category IV are similar to those presented in Category III, however,

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additional volumes of soil and sediment will be treated; approximately 1,100 cubic yards. In addition, capping and deed restrictions would not be required because the cleanup level corresponds to the TSCA spill cleanup policys' non-restricted definition.

5.4.1 Offsite Landfill

This alternative involves excavating all soils and sediment that contain PCB's in excess of 10 ppm. The excavation would be completed according to procedures presented in Section 4.3.1. The excavated area would be backfilled with clean fill and the PCB soils/sediment would be transported and disposed of at a permitted TSCA chemical waste landfill.

5.4.2 Offsite Landfilling and Thermal Destruction of Soils in Excess of 500 ppm

This alternative would include all of the same procedures as Alternative 4.4.1, but soil containing PCB's in excess of 500 ppm would be segregated, transported to a permitted Annex I incinerator and the waste would be thermally destroyed. Approximately 36 cubic yards of soil would be incinerated.

5.4.3 Onsite Bioremediation

This alternative would include the construction of leach beds equipped with a liner and underdrains on the site. All soil and sediment containing PCB concentrations in excess of 10 ppm would be excavated and placed in the leach beds. The excavated soil and sediment would be washed with detergents and the leachate would be collected. The leachate would be injected into the bioreactor and the leached soils would then be fed into the bioreactor.

5.4.4 Onsite Bioremediation and Offsite Thermal Destruction of Soils which Contain PCB's in Excess of 500 ppm

This alternative would entail all of the same procedures as Alternative 4.4.3, but would provide for soil containing PCB's in excess of 500 ppm to be segregated. The segregated soils would be transported to a permitted Annex I incinerator and the waste would be thermally destroyed. Approximately 36 cubic yards of soil would be thermally destroyed.

5.4.5 Onsite Incineration

Soil containing in excess of 10 ppm would be excavated, incinerated and the ash would be returned to the excavation. The volume of soils requiring incineration is approximately 1,100 cubic yards. The incineration process is identical to those described in Section 4.3.5.

5.4.6 Offsite Incineration

This technology would involve excavation of all soils in excess of 10 ppm and replacement with clean fill. The excavated soil would be transported to a permitted Annex I incinerator and the waste would be thermally destroyed. Further treatment of the residual ash following incineration may be required if the waste material still contains hazardous components.

6.0 EVALUATION OF REMEDIAL ALTERNATIVES

6.1 Introduction

This section provides the analysis and presentation of relevant information which are required to provide a foundation for the selection of a remedial alternative at the Hooker/Ruco PCB OU. All retained alternatives, which were discussed in detail in Section 5.0 have been assessed against nine evaluation criteria as required in the NCP 40 CFR 300.430(e).

6.2 Evaluation Criteria

To evaluate the relative merits and deficiencies of the retained remedial alternatives, the following nine criteria have been considered.

- short-term effectiveness
- long-term effectiveness
- reduction of toxicity, mobility and volume
- implementability
- costs
- compliance with the ARAR's
- overall protection of human health and the environment
- State acceptance
- community acceptance

The evaluation of the retained alternatives against the nine criteria are summarized in table 6-1. Detailed cost estimates for each alternative are presented in table 6-2.

6.3 Category I - No Action

The site is an active manufacturing facility and although the majority of the OU area is paved, the potential for airborne releases from the already excavated soil or the recharge basin do exist. The no action alternative will not achieve any of the remedial response objectives. The

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alternative does not result in a reduction of the mobility, toxicity or volume of PCB soils and for this reason, a substantial risk to human health and the environment would remain at the site. The no action response, although easily implemented and inexpensive, does not fulfill the requirement of SARA that to the extent practicable the selected remedy uses permanent solutions. The no action response was retained to establish a base line against which other retained remedial alternatives could be evaluated.

6.4 Category II - In-Situ Containment

In-situ containment of the spill and transport related areas could achieve a substantial reduction in the exposure potential in a relatively short time period, approximately three weeks. The long-term effectiveness of the containment system is subject to disruption, however, because the OU area is underlain by a high percentage of utilities. Access to the utilities would require health and safety precautions and a health and safety plan would have to be kept onsite for such eventualities.

This remedy has been employed at Superfund sites containing both small (4,800 cubic yards) and large (45,000 cubic yards) volumes of PCB waste. Onsite containment is a proven solution that satisfies the requirements for a significant reduction of the mobility of the PCB waste. This alternative provides a high level of effectiveness at a low cost.

In-situ containment, however, does not address the excavated soil or the recharge basin soils and sediments. This option is unsuitable unless the recharge basin's function as a permitted discharge point is eliminated or taken over by another basin.

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6.5 Category III - Institutional Actions with a Cleanup Level of 25 ppm

6.5.1 Offsite Alternatives

Three offsite alternatives under Category III have been retained and evaluated. They include landfilling, incineration and a combination of landfilling and incineration. All offsite options address exposure to the PCB's via ingestion, direct contact and inhalation pathways. Removal of the waste will significantly reduce the present and future onsite risks to human health and the environment.

Of the retained offsite technologies in Category III, offsite land disposal of the 700 cubic yards of soil offers the most cost-effective method of remediation of the perceived environmental threat. Preference for selecting this alternative has been found in ROD's for Superfund sites that have characteristics similar to the Hooker/Ruco site, an example being the MGM Brakes site (EPA/ROD/ROA-88/018).

Offsite incineration is extremely cost prohibitive with respect to its overall effectiveness and does not increase protection of public health and the environment related to materials handling and exposure levels when compared to disposal in a TSCA landfill. Supporting ROD's for selection of this alternative have been found to exist at a limited number of Superfund sites, but only where the primary media containing PCB's was liquid waste.

A combination of landfilling and thermal destruction, would provide an effective method of remediating, the PCB wastes with an added benefit of partial treatment as an integral part of the technology. The incineration of 36 cubic yards of soil containing PCB's in excess of 500 ppm is much more costly, however, and does not offer additional protection of public health and the environment.

All of the offsite options are highly implementable using proven technologies to remediate the PCB waste. The cleanup criteria of 25 ppm will, however, require deed restrictions to maintain the industrial restricted status. Implementation of deed restriction is not administratively difficult on the Ruco Polymer property, but restrictions which would extend onto Grumman property may be difficult to obtain.

6.5.2 Onsite Alternatives

Three onsite alternatives under Category III have been retained and evaluated. They include bioremediation, bioremediation with offsite incineration, and onsite incineration. Superfund sites, where onsite remedies have been selected, characteristically contain volumes of PCB waste in excess of 10,000 cubic yards. The Hooker/Ruco site, however, contains only 700 cubic yards and onsite remedial alternatives are extremely cost prohibitive. In addition, OCC does not own or operate the plant and all onsite or long-duration solutions may be logistically difficult.

Both onsite bioremediation and onsite incineration require pilot testing, effectiveness demonstrations, and mobilization and demobilization. These factors significantly increase the cost for the destruction of a small volume of wastes.

Bioremediation has ambient temperature constraints, which require the treatment to be completed during the summer months. Because bioremediation has been estimated to require two years (Detox presentation in the Appendix) to complete, the short-term effectiveness of this approach is significantly reduced.

The onsite alternatives in Category III will not address soils with PCB's less than 25 ppm. Because residual PCB waste will remain onsite, administrative deed restrictions will be required to maintain the site's industrial restricted status. Implementation of deed restrictions is not administratively difficult on the Ruco Polymer property, but may be difficult on Grumman property.

6.6 Category IV - Institutional Actions with a Cleanup Level of 10 ppm

6.6.1 Offsite Alternatives

Discussions identical to Section 5.5.1 exist for the three offsite alternatives retained and evaluated in Category IV. The implementation of each solution, however, would be enhanced because the requirement for administrative deed restrictions are not applicable.

6.6.2 Onsite Alternatives

The three retained onsite alternatives; bioremediation, bioremediation and offsite incineration, and onsite incineration, are cost prohibitive and difficult to implement on an active manufacturing facility not owned by OCC.

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June 7, 1990
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TABLES

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TABLE 1-1

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

RELATIONSHIP OF SCREENING CRITERIA TO THE NINE EVALUATION CRITERIA

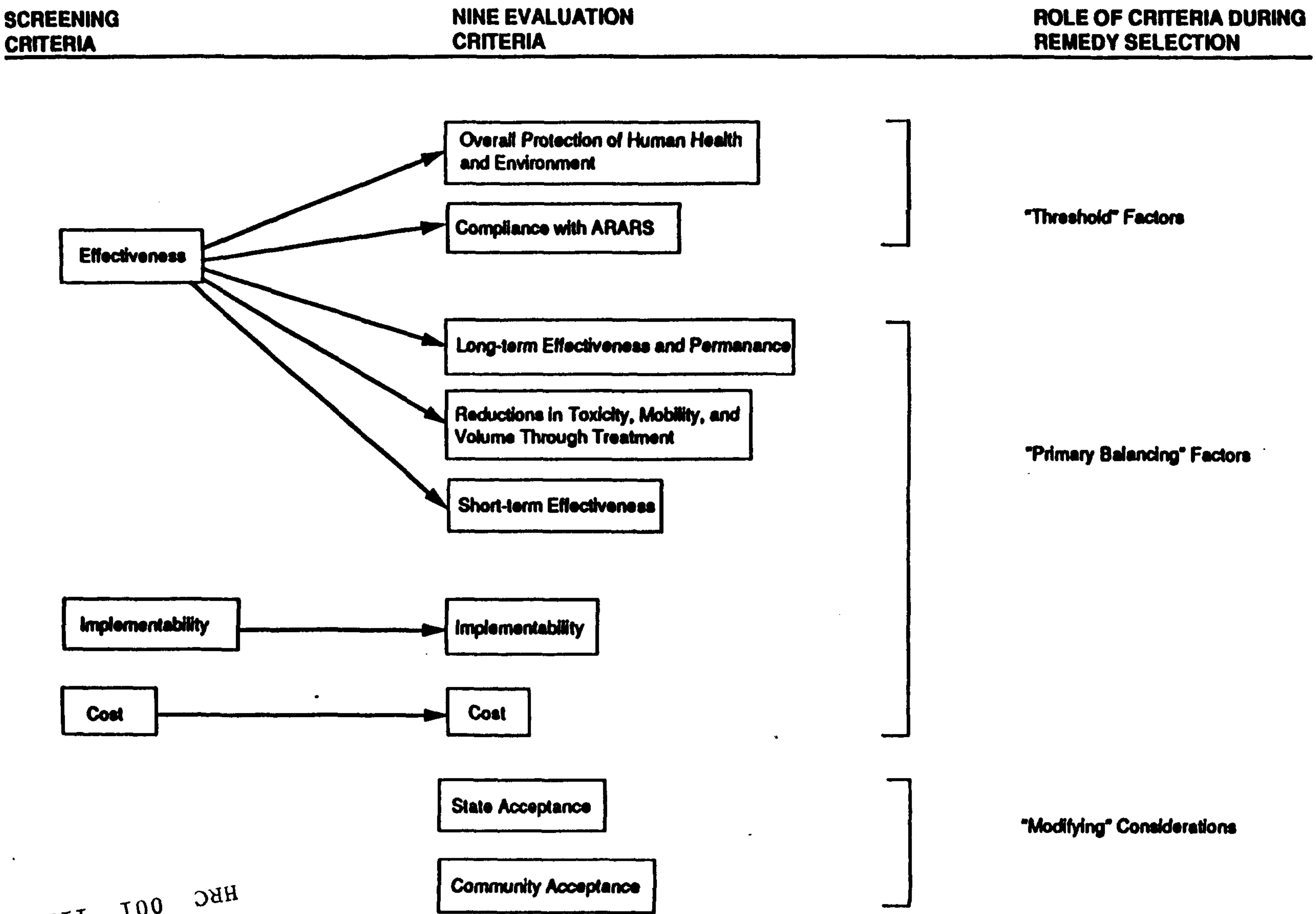

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TABLE 1-2

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

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For PCB's in Soil

Report of Ground-Water and Soils Investigations at the Former Ruco Division Plantsite, Hicksville, New York; Leggette, Brashears & Graham, Inc., August 1984.

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TABLE 2-1

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Applicable or Relevant and
Appropriate Requirements for Remediation
of Soils with PCB's

Toxic Substance Control Act (TSCA)

40 CFR, Chapter II, - excludes spills previous to May 4, 1987 under TSCA (Federal Register 4187)
40 CFR, Chapter IV 761 (40 CFR 765.60) - removal; disposal limits
40 CFR 765.75, chemical waste landfills
40 CFR 761.70, PCB destruction limits in incinerator

Comprehensive Environmental Response Compensation and Liability Act (CERCLA)

40 CFR 300.65, removals
40 CFR 300.68, remedial action
40 CFR 300.70, methods of remedying releases

National Contingency Plan (NCP)
Amendments to CERCLA

Superfund Amendments and Reauthorization Act (SARA)
Amendments to CERCLA

Resource Conservation and Recovery Act (RCRA)

40 CFR 261-ID: listing hazardous waste
40 CFR 264, subparts B, F, G, N, O
40 CFR 265, subparts B, F, G, N, O, P, Q

Hazardous and Solid Waste Amendments to RCRA

RCRA Remedial Facility Investigation (RFI) Guidance

Volume I EPA 530/SW-87-001, July 1987, draft

New York State Solid Waste Management Regulations

6NYCRR Part 212 - general process emission sources
6NYCRR Part 360
6NYCRR Part 370-373(4)
6NYCRR Part 364 - generator requirements

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TABLE 2-1
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Applicable or Relevant and Appropriate Requirements for Remediation of Soils with PCB's

United States Department of Transportation (USDOT)

- 49 CFR 172, 173, generator requirements
- 40 CFR 263, generator requirements
- 40 CFR 262.3, shipping and packing
- 49 CFR 173, shipping and packing

Occupational Safety and Health Act (OSHA)

- All regulations including NIOSH 1985
- 29 CRF 1926, Subpart C

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TABLE 3-1

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Identification and Initial Screening of Remedial Technologies for Soils Containing PCB's

Technology	Description	Reason for Elimination During Initial Screening
No Action	Physical and institutional site restrictions.	Retained
Onsite Remediation	Technologies which do not entail removing the soil from the site.	
Incineration	Excavate soil and feed to an onsite mobile incinerator approved for PCB destruction by EPA; ash disposal in excavation.	Retained
Advanced Electric Reactor	The AER is a patented thermal treatment process that uses a high temperature fluid wall reactor. Carbon electrodes heat a vertical reactor core to incandescence. As wastes fall through the core by gravity flow, they are rapidly heated via radiant heat transfer to 2,200°C. The feed is isolated for the core walls by a gaseous blanket of nitrogen that flows radially inward through the porous core wall. PCB's are transformed as principal products into H_2, Cl_2, HCl, elemental carbon, and solid-derived waste by pyrolysis. After leaving the main reactor, the product gas and waste solids pass through two post-reactors, one providing additional high-temperature (1095°C) residence time and the other cooling the	This technology is unproven in field applications.

TABLE 3-1
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Identification and Initial Screening of Remedial Technologies for Soils Containing PCB's

Technology	Description	Reason for Elimination During Initial Screening
Advanced Electric Reactor (continued)	gas to around 538°C. Product gas goes through a baghouse for fine particle removal, an aqueous-caustic scrubber for chlorine removal, and activated carbon beds to remove any organic residues. The AER and auxiliary equipment (crushers, grinders, etc.) require approximately 1,300 kilowatt-hours per ton of soil treated. The soil must be dried and sized to no larger than 35 mesh before it can be fed to the reactor.	
Containment/ Encapsulation	Create a chemical waste landfill on the property which would conform to RCRA standards; obtain RCRA Part B permit; excavate and landfill the soil; provide physical and institutional restrictions.	Technical requirements for a chemical waste landfill (Fed. Reg. Vol. 44, No. 106, 5/31/79) include: "soils: The landfill site shall be located in thick, relatively impermeable formations such as large area clay pans. Where this is not possible, the soil shall have a high clay and silt content..." This condition cannot be met and would require a waiver. This is also a high cost alternative considering the technological and permitting requirements.

TABLE 3-1
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Identification and Initial Screening of Remedial Technologies for Soils Containing PCB's

Technology	Description	Reason for Elimination During Initial Screening
<u>Chemical Methods</u> KPEG Terraclean-CL	Terraclean-Cl is a patented extraction process that chemically dehalogenates PCB's under mild conditions. During this process, contaminated soil is mixed with an equal volume of 150°C solvent and rotated in a mixer. The solvent consists of a mixture of polyglycols and capped polyglycols (PEG and PEGM), potassium hydroxide (KOH), and dimethyl sulfoxide (DMSO). DMSO acts as a catalyst and phase transfer agent to extract the PCB's from the soil. The actual solvent composition is determined by soil and contaminant characteristics. Extraction time also depends on soil and contaminant type, but is usually between 30 and 120 minutes. After extraction, the major portion of the solvent is decanted from the soil and any residual solvent or dechlorinated by-products are removed by triple-rinsing the soil with water.	This technology has been selected at the Wide Beach Superfund site. Pilot-scale testing has been completed, but full scale implementation has not been undertaken. The technology is not commercially available. The Hooker/Ruco site is too small to provide the volume of material for cost-effective implementation.
LARC Process	The Light Activated Reduction of Chemicals (LARC) process uses UV light to dehalogenate chlorinated compounds that have been extracted from contaminated soils. Isopropanol is used as the extraction solvent because it is relatively inexpensive and dissolves PCB's readily. Soils are first	None of the technologies in this category have been proven in field conditions. The Hooker/Ruco site is too small to provide the volume of material or financial support to sustain experimentation.

TABLE 3-1
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Identification and Initial Screening of Remedial
Technologies for Soils Containing PCB's

Technology	Description	Reason for Elimination During Initial Screening
Bio-Clean Process (continued)	Bloomington, Minnesota. A limitation of their treatment is that high PCB concentrations (300 ppm) can inhibit or halt the degradation process. This requires controlling concentration levels with a premix tank or similar device.	
Detox Augmented Bioreclamation	Augmented bioreclamation uses a detergent leaching process to reduce the concentrations of PCB's in the soil. The leachate is then fed to a bioreactor, followed by the soil. The remediated soil is replaced in the exacavation.	Retained.
In Situ Remediation	Methods which do not require excavation of the soil.	
Battelle In Situ Vitrification	Vitrification stabilizes contaminated soils by melting them in situ to form a vitrified block of durable, crystalline glass. The temperatures involved (1700°C) pyrolyze organic materials, which diffuse to the surface for collection, combustion, and treatment. Any remaining ash or incombustible material is encapsulated in the melt. In laboratory tests, cylindrical molybdenum electrodes were placed in contaminated soil. A path was	The presence of underground utilities renders this technique infeasible. A gas collection cover is also needed. Gas escape into buildings is likely and dangerous.

TABLE 3-1
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Identification and Initial Screening of Remedial Technologies for Soils Containing PCB's

Technology	Description	Reason for Elimination During Initial Screening
OHM Methanol Extraction (continued)	subsequently incinerated. The decontaminated soil can then be landfarmed for degradation of residual methanol, and wastewaters are treated in a holding pond.	
Soilex Solvent Extraction	Developed at Oak Ridge National Laboratory, this extraction process uses kerosene and water as the solvent of choice. Water assists in breaking up soil particles, and PCB's and oil are soluble in the kerosene. Soil-to-water ratios of 3 to 5 and soil-to-kerosene ratios of 3 to 5 were found to be most effective. Three counter-current batch stir tanks were used in the pilot study to extract PCB's from soil. Each batch of sediment require one day in each of the stir tanks for treatment, with most of the processing time being spent in allowing the solid and liquid phases to settle and separate. PCB contaminated kerosene is recovered by steam stripping, which concentrates the PCB's in the still bottoms. The concentrated PCB product is treated and disposed of as a RCRA waste.	
MODAR Supercritical Water Oxidation	This oxidation process uses temperatures and pressures of supercritical water (above 374°C and over 218 atmospheres) to convert hazardous organics to carbon dioxide, water, and other less harmful products. The sediments are fed to the oxidizer as a	

TABLE 3-1
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Identification and Initial Screening of Remedial
Technologies for Soils Containing PCB's

Technology	Description	Reason for Elimination During Initial Screening
MODAR Supercritical Water Oxidation	pressurized, heated slurry (20-40 percent solids). Pressurized oxygen and a source of organic fuel (required to provide the energy needs of the oxidation process) are also added to the oxidizer. In the oxidizer, chlorine atoms from chlorinated organics are transformed to chloride ions, nitrogen to nitrogen gas, sulfur to sulfates, and phosphorous to phosphates. By adding cations (e.g., Na^+, Mg^{++}, Ca^{++}), inorganic salts are formed. The effluent from the oxidizer is then fed to a salt and sediment separator where solids are removed as a slurry.	
Biological		
Bio-Clean Process	The Bio-Clean process uses specially selected, naturally occuring microorganisms to degrade PCB's. Contaminated sediments are first sterilized with heat and caustic before being innoculated with the selected bacteria. After innoculation, the PCB soil degrades over approximately a three-day period. The degradation is an aerobic process and uses sterile filtered air for oxygen requirements. Degradation products are CO_2, NaCl and bacterial cells. The micro-organism Arthrobacteria sp was used in laboratory tests, but other species including Alcaligenis eutrophus and Pseudomonas putida show capabilities for degrading PCB's as well. The Bio-Clean process was developed by Bio-Clean, Inc. of	This technology would be feasible for the transport-related areas and the sump sediments. The high concentrations of PCB's in the spill area render this technique unreliable.

TABLE 3-1
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Identification and Initial Screening of Remedial Technologies for Soils Containing PCB's

Technology	Description	Reason for Elimination During Initial Screening
Bio-Clean Process (continued)	Bloomington, Minnesota. A limitation of their treatment is that high PCB concentrations (300 ppm) can inhibit or halt the degradation process. This requires controlling concentration levels with a premix tank or similar device.	
Sybron's Augmented Bioreclamation	Augmented bioreclamation uses a detergent leaching process to reduce the concentrations of PCB's in the soil. The leachate is then fed to a bioreactor, followed by the soil. The remediated soil is replaced in the exacavation.	Retained.
In Situ Remediation	Methods which do not require excavation of the soil.	
Battelle In Situ Vitrification	Vitrification stabilizes contaminated soils by melting them in situ to form a vitrified block of durable, crystalline glass. The temperatures involved (1700°C) pyrolyze organic materials, which diffuse to the surface for collection, combustion, and treatment. Any remaining ash or incombustible material is encapsulated in the melt. In laboratory tests, cylindrical molybdenum electrodes were placed in contaminated soil. A path was	The presence of underground utilities renders this technique infeasible. A gas collection cover is also needed. Gas escape into buildings is likely and dangerous.

TABLE 3-1
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Identification and Initial Screening of Remedial Technologies for Soils Containing PCB's

Technology	Description	Reason for Elimination During Initial Screening
Battelle In Situ Vitrification (continued)	established by placing a graphite and glass frit mixture between the electrodes on the soil surface. Electric power was applied for about six hours, resulting in the formation of the vitrified block. The disadvantages of the vitrification process are that the soil must be pre-dried (requiring extra energy costs) and the product is a crystalline block which is more costly to redeposit.	
In Situ Immobilization	Cementatious grouts are injected into the soil to form non-leaching monolithic blocks of soil/grout.	Existing utilities would be incorporated in the blocks and would be unserviceable. The recharge basin would no longer be able to function and would require replacement and repermitting.
In Situ <u>Bioremediation</u> Sybron Bi-Chem 1006	The Sybron Bi-Chem process is a biological degradation technique that uses aerobic and anaerobic microbial activity for in situ decontamination of sediments. Although the process is still undergoing laboratory testing, the proposed concept involves injecting microorganisms and nutrients into submerged sediments and containing them while degradation occurs over an extended period. In tests on Hudson River PCB-contaminated sediments and municipal	Unavailable for commercial applications. May have limitations in high concentrations of PCB's.

TABLE 3-1
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Identification and Initial Screening of Remedial Technologies for Soils Containing PCB's

Technology	Description	Reason for Elimination During Initial Screening
Sybron Bi-Chem 1006 (continued)	sewage sludge, Sybron Bi-Chem has shown some success in reducing PCB levels. However, engineering data and cost information necessary to determine the feasibility of the technique is not yet available.	
Containment	Utilizes multimedia caps or paving materials to isolate the soils from contact. Institutional restrictions put in place.	Retained.
Encapsulation	Utilize slurry walls and capping to encapsulate the soils.	There is no low-permeability layer for the walls to key into. Pressure injected grouts to form a basement layer may be unreliable and difficult to test. Given the great depth to water (±50 ft) this technology has no advantages over containment.
Offsite Remediation	Excavation and removal from the site.	Retained.

TABLE 3-1
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Identification and Initial Screening of Remedial Technologies for Soils Containing PCB's

Technology	Description	Reason for Elimination During Initial Screening
Incineration	Excavation and incineration at an Annex I approved incinerator; landilling of ash.	Retained.
Chemical Waste Landfill	Excavation and disposal at an approved chemical waste landfill.	Retained.

TABLE 3-2

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Technologies for Addressing Soils Containing PCB's
Retained After Initial Screening

No Action

Onsite Actions
- Incineration
- Biological

In-Situ Actions
- Containment

Offsite Actions
- Incineration
- Landfill

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TABLE 4-1

OCCIDENTIAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Process Options and Operable Unit Evaluation for a
Remediation Level of 500 ppm (parts per million)

Category	Remedial Alternative	Operable unit	500 ppm volume or area	Effectiveness	Implementability	Unit cost
No - Action	Security measures	Spill area	30 l.ft 1/	Not effective. Required for consideration by NCP.	Highly implementable.	$3.33/l.ft
In-situ Containment	Capping	Spill area	100 sq.ft	Effective in reducing dermal contact. Does not reduce the toxicity or volume of the PCB soils.	Highly implementable.	$3.00/sq.ft
Onsite Alternatives	Biological treatment	Spill area	43 tons	Effectiveness is reduced because of the long time span required for remediation to be implemented. Because of PCB concentrations, bioreaction will require multiple steps.	Onsite provisions would be required to construct bioreactors. Units are readily available. Would require pilot testing prior to acceptance.	$4,288/ton
	Thermal destruction	Spill area	43 tons	Highly effective. This alternative will destroy the PCB waste.	Provisions would be required to errect an onsite rotary kiln. Area would be required to store untreated soil prior to incineration. Would require pilot testing prior to acceptance.	$3,963/ton
Offsite Alternatives	Landfilling	Spill area	43 tons	This alternative is effective in removing the PCB soils, however, it will not reduce the toxicity or net volume of impacted soils.	Highly implementable. This alternative has been employed at other hazardous waste sites.	$473/ton
	Thermal destruction	Spill area	43 tons	Highly effective. This alternative will permanently destroy the PCB waste.	Highly implementable. This alternative has been employed at other hazardous waste sites.	$1,775/ton

1/ Linear feet

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TABL

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Process Options and Operable Unit Evaluation for
Remediation Levels of 10 and 25 ppm

Category	Remedial alternatives	Operable unit	Volume/Area		Effectiveness	Implementability	Unit Cost	
			25 ppm	10 ppm			25 ppm	10 ppm
No - Action	Security	Transport related areas	800 l.ft[1]	1,000 l.ft	Not effective. Required for for consideration by NCP.	Highly implementable.	$3.33/l.ft	$3.33/l.ft
		Excavated soils	240 l.ft	240 l.ft	Not effective. Required for for consideration by NCP.	Highly implementable.	$3.33/l.ft	$3.33/l.ft
		Recharge basin	300 l.ft	300 l.ft	Not effective. Required for for consideration by NCP.	Highly implementable.	$3.33/l.ft	$3.33/l.ft
In-Situ Containment	Capping	Transport related areas	3,800 sq.ft	4,700 sq.ft	Effective in reducing dermal contact. Does not reduce the volume or toxicity of the soil.	Easily implemented.	$3/sq.ft	$3/sq.ft
		Excavated areas	410 sq.ft	410 sq.ft	Effective in reducing dermal contact. Does not reduce the volume or toxicity of the soil.	Difficult to pave excavated soils.	$3/sq.ft	$3/sq.ft
		Recharge basin soils	770 sq.ft	2,400 sq.ft	Effective in reducing dermal contact. Does not reduce the volume or toxicity of the soil.	Easily implemented, however, will destroy existing recharge basins' function.	$3/sq.ft	$3/sq.ft
Onsite Alternatives	Biological treatment	Transport related areas	640 tons	830 tons	Effectiveness is reduced because of the anticipated time span required for this alternative.	Onsite provisions would be required to construct bioreactors. This alternative would require pilot testing prior to acceptance. Bioreactors are available commercially.	$1,034/ton	$980/ton

TABLE 4
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Process Options and Operable Unit Evaluation for
Remediation Levels of 10 and 25 ppm

Category	Remedial alternatives	Operable unit	Volume/Area		Effectiveness	Implementability	Unit Cost	
			25 ppm	10 ppm			25 ppm	10 ppm
Onsite Alternatives (continued)		Excavated soils	70 tons	70 tons	Effectiveness is reduced because of the anticipated time span required for this alternative.	Onsite provisions would be required to construct bioreactors. This alternative would require pilot testing prior to acceptance. Bioreactors are available commercially.	$2,942/ton	$2,942/ton
		Recharge basin soils	130 tons	420 tons	Effectiveness is reduced because of the anticipated time span required for this alternative.	Onsite provisions would be required to construct bioreactors. This alternative would require pilot testing prior to acceptance. Bioreactors are available commercially.	$1,953/ton	$1,157/ton
	Thermal destruction	Transport related areas	640 tons	830 tons	Highly effective.	Provisions would be required to construct onsite rotary kiln and to stage untreated soil prior to incineration. This alternative would require pilot testing prior to acceptance.	$709/ton	$659/ton
		Excavated soils	70 tons	70 tons	Highly effective.	Provisions would be required to construct onsite rotary kiln incinerator and to stage untreated soil prior to incineration. This alternative would require pilot testing prior to acceptance.	$2,617/ton	$2,617/ton

TABLE 4-2
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Process Options and Operable Unit Evaluation for
Remediation Levels of 10 and 25 ppm

Category	Remedial alternatives	Operable unit	Volume/Area 25 ppm	Volume/Area 10 ppm	Effectiveness	Implementability	Unit Cost 25 ppm	Unit Cost 10 ppm
Onsite Alternatives (continued)		Recharge basin soils	130 tons	420 tons	Highly effective.	Provisions would be required to construct onsite rotary kiln incinerator and to stage untreated soil prior to incineration. This alternative would require pilot testing prior to acceptance.	$1,628/ton	$832/ton
Offsite Alternatives	Landfilling	Transport related areas	640 tons	830 tons	This alternative is effective in removing the PCB soils from the site, however, it does not reduce the toxicity or net volume of the soils.	Highly implementable. This alternative has been employed at other hazardous waste sites.	$473/ton	$473/ton
		Excavated soils	70 tons	70 tons	This alternative is effective in removing the PCB soils from the site, however, it does not reduce the toxicity or net volume of the soils.	Highly implementable. This alternative has been employed at other hazardous waste sites.	$473/ton	$473/ton
		Recharge Basin	130 tons	130 tons	This alternative is effective in removing the PCB soils from the site, however, it does not reduce the toxicity or net volume of the soils.	Highly implementable. This alternative has been employed at other hazardous waste sites.	$473/ton	$473/ton

TABLE - _
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Process Options and Operable Unit Evaluation for
Remediation Levels of 10 and 25 ppm

Category	Remedial alternatives	Operable unit	Volume/Area		Effectiveness	Implementability	Unit Cost	
			25 ppm	10 ppm			25 ppm	10 ppm
Offsite Alternatives (continued)	Thermal destruction	Transport related areas	640 tons	830 tons	Highly effective. This altertive will permanently destroy the PCB waste.	Highly implementable. This alternative has been empolyed at other hazardous waste sites.	$1,775/ton	$1,775/ton
		Excavated soils	70 tons	70 tons	Highly effective. This altertive will permanently destroy the PCB waste.	Highly implementable. This alternative has been empolyed at other hazardous waste sites.	$1,775/ton	$1,775/ton
		Recharge basin soils	130 tons	420 tons	Highly effective. This altertive will permanently destroy the PCB waste.	Highly implementable. This alternative has been empolyed at other hazardous waste sites.	$1,775/ton	$1,775/ton

1/ Linear feet.

TABLE 6-2

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Remedial Alternative Costs

Method of treatment	Quantity	Unit cost	Subtotal	Approximate treatment time[1/]
1. NO ACTION - SECURITY.				
Measures, fencing, etc.	1,500 linear ft	$3.33/ft	$ 5,000	2 days
Replacement[2/]			5,000	2 days
Annual Monitoring	1 well cluster/ 30 years	3,000	90,000	30 years
Engineering		10%	10,000	
Bonds and insurance		1%	1,000	
Contingency		25%	25,000	
Health and safety		3%	3,000	
Total Cost			$139,000	
2. IN-SITU CONTAINMENT.				
Paving	7,600 sq.ft	$3/sq.ft	$ 23,000	4 days
Replacement			23,000	4 days
Biannual Inspection	2 inspections a year/30 years	500/ inspection	30,000	30 years
Engineering		10%	7,600	
Bonds and Insurance		1%	760	
Contingency		25%	19,000	
Health and safety		3%	2,280	
Total Cost			$105,640	

HRC 001 1212

TABLE 6-2
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Remedial Alternative Costs

Method of treatment	Quantity	Unit cost	Subtotal	Approximate treatment time[1/]
3. EXCAVATION AND OFFSITE LANDFILLING OF SOILS IN EXCESS OF 25 PPM.				
Excavation	840 tons	$175/ton	$147,000	12 days
Transport and disposal	840 tons	298/ton	250,320	5 days
Paving	7,600 sq.ft	3/foot	23,000	4 days
Replacement			23,000	4 days
Biannual Inspection	30 years	500/ inspection	30,000	30 years
Engineering		10%	47,332	
Bonds and insurance		1%	4,733	
Contingency		25%	118,330	
Health and safety		3%	14,199	
Confirmation sampling	40 samples	300/sample	12,000	
Total Cost			$669,914	
4. EXCAVATION AND OFFSITE LANDFILLING OF SOILS IN EXCESS OF 25 PPM. INCINERATION OF SOILS IN EXCESS OF 500 PPM.				
Excavation	840 tons	$175/ton	$147,000	12 days
Transport and disposal	797 tons	298/ton	237,506	5 days
Incineration	43 tons	1,600/ton[3/]	68,800	
Paving	7,600 sq.ft	3/sq.ft	23,000	4 days
Replacement			23,000	4 days
Biannual Inspection	30 years	500/ inspection	30,000	30 years
Engineering		10%	52,930	
Bonds and insurance		1%	5,293	

HRC 001 1213

TABLE 6-2
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Remedial Alternative Costs

Method of treatment	Quantity	Unit cost	Subtotal	Approximate treatment time[1/]
4. EXCAVATION AND OFFSITE LANDFILLING OF SOILS IN EXCESS OF 25 PPM. INCINERATION OF SOILS IN EXCESS OF 500 PPM. (continued)				
Contingency		25%	132,326	
Health and safety		3%	15,879	
Confirmatory sampling	40 samples	300/sample	12,000	
Total Cost			$747,734	
5. ONSITE BIOREMEDIATION OF SOILS IN EXCESS OF 25 PPM.				
Excavation	840 tons	$175/ton	$ 147,000	12 days
Bioremediation	840 tons	625/ton	525,000	2 summers
Mobilization/ demobilization, pilot testing			150,000[4/]	
Paving	7,600 sq.ft	3/sq.ft	23,000	4 days
Replacement			23,000	4 days
Biannual Inspection	30 years	500/ inspection	30,000	30 years
Engineering		10%	89,800	
Bonds and insurance		1%	8,980	
Contingency		25%	224,500	
Health and safety		3%	26,940	
Confirmatory sampling	40 samples	300/sample	12,000	
Total Cost			$1,260,220	

HRC 001 1214

TABLE 6-2
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Remedial Alternative Costs

Method of treatment	Quantity	Unit cost	Subtotal	Approximate treatment time[1/]
6. ONSITE BIOREMEDIATION OF SOILS IN EXCESS OF 25 PPM. INCINERATION OF SOILS IN EXCESS OF 500 PPM.				
Excavation	840 tons	$175/ton	$ 147,000	12 days
Bioremediation	797 tons	625/ton	498,125	1-2 summers
Mobilization/ demobilization pilot testing		150,000	150,000	
Incineration	43 tons	1,600/ton	68,800	
Paving			23,000	4 days
Replacement			23,000	4 days
Biannual Inspection	30 years	500/ inspection	30,000	30 years
Engineering		10%	93,992	
Bonds and insurance		1%	9,399	
Contingency		25%	234,981	
Health and safety		3%	28,197	
Confirmatory sampling	40 samples	300/sample	12,000	
Total Cost			$1,318,494	
7. ONSITE THERMAL DESTRUCTION OF SOILS IN EXCESS OF 25 PPM.				
Excavation	840 tons	$175/ton	$147,000	12 days
Incineration	840 tons	750/ton	630,000	20 days
Mobilization/ demobilization pilot testing		150,000	150,000	

TABLE 6-2
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Remedial Alternative Costs

Method of treatment	Quantity	Unit cost	Subtotal	Approximate treatment time[1/]
7. ONSITE THERMAL DESTRUCTION OF SOILS IN EXCESS OF 25 PPM. (continued)				
Paving	7,600 sq.ft	3/sq.ft	23,000	4 days
Replacement		23,000	23,000	4 days
Biannual Inspection	30 years	500/ inspection	30,000	30 years
Engineering		10%	100,300	
Bonds and insurance		1%	10,030	
Contingency		25%	250,750	
Health and Safety		3%	30,090	
Confirmatory sampling	40 samples	300/sample	12,000	
Total Cost			$1,406,170[5/]	
8. OFFSITE THERMAL DESTRUCTION OF SOILS IN EXCESS OF 25 PPM.				
Excavation	840 tons	$175/ton	$ 174,000	12 days
Incineration	840 tons	1,600/ton	1,344,000	
Paving	7,600 sq.ft	3/sq.ft	23,000	4 days
Replacement		23,000	23,000	4 days
Biannual Inspection	30 years	500/ inspection	30,000	30 years
Engineering		10%	156,700	
Bonds and insurance		1%	15,670	

HRC 001 1216

TABLE 6-2
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Remedial Alternative Costs

Method of treatment	Quantity	Unit cost	Subtotal	Approximate treatment time[1/]
8. OFFSITE THERMAL DESTRUCTION OF SOILS IN EXCESS OF 25 PPM. (continued)				
Contingency		25%	391,750	
Health and safety		1%	47,010	
Confirmatory sampling	40 samples	300/sample	12,000	
Total Cost			$2,190,130	
9. OFFSITE LANDFILLING OF SOILS IN EXCESS OF 10 PPM.				
Excavation	1,320 tons	$175/ton	$231,000	18 days
Transport and disposal	1,320 tons	298/ton	393,360	7 days
Repaving	7,600 sq.ft	3/sq.ft	23,000	4 days
Engineering		10%	64,736	
Bonds and insurance		1%	6,474	
Contingency		25%	161,840	
Health and safety		3%	19,420	
Confirmatory sampling	60 samples	$300/sample	18,000	
Total Cost			$917,830	
10. OFFSITE LANDFILLING OF SOILS IN EXCESS OF 10 PPM. INCINERATION OF SOILS IN EXCESS OF 500 PPM.				
Excavation	1,320 tons	$175/ton	$231,000	18 days
Transport and disposal	1,277 tons	298/ton	380,546	7 days
Incineration	43 tons	1,600/ton	68,800	
Repaving	7,600 sq.ft	3/sq.ft	23,000	4 days

HRC 001 1217

TABLE 6-2
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Remedial Alternative Costs

Method of treatment	Quantity	Unit cost	Subtotal	Approximate treatment time[1/]
10. OFFSITE LANDFILLING OF SOILS IN EXCESS OF 10 PPM. INCINERATION OF SOILS IN EXCESS OF 500 PPM. (continued)				
Engineering		10%	70,335	
Bonds and insurance		1%	7,033	
Contingency		25%	175,836	
Health and safety		3%	21,100	
Confirmatory sampling	60 samples	300/sample	18,000	
Total Cost			$995,650	
11. ONSITE BIOREMEDIATION OF SOILS IN EXCESS OF 10 PPM.				
Excavation	1,320 tons	$175/ton	$ 231,000	18 days
Bioremediation	1,320 tons	625/ton	825,000	3 summers
Mobilization/ demobilization, pilot testing		150,000	150,000	
Repaving	7,600 sq.ft	3/sq.ft	23,000	4 days
Engineering		10%	122,900	
Bonds and insurance		1%	12,290	
Contingency		25%	307,250	
Health and safety		3%	36,870	
Confirmatory sampling	60 samples	300/sample	18,000	
Total Cost			$1,726,310	

HRC 001 1218

TABLE 6-2
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Remedial Alternative Costs

Method of treatment	Quantity	Unit cost	Subtotal	Approximate treatment time[1/]
12. ONSITE BIOREMEDIATION OF SOILS IN EXCESS OF 10 PPM. INCINERATION OF SOILS IN EXCESS OF 500 PPM.				
Excavation	1,320 tons	$175/ton	$ 231,000	18 days
Bioremediation	1,277 tons	625/ton	798,125	2-3 summers
Mobilization/ demobilization pilot testing		150,000	150,000	
Incineration	43 tons	1,600/ton	68,800	
Repaving	7,600 sq.ft	3/sq.ft	23,000	4 days
Engineering		10%	127,092	
Bonds and insurance		1%	12,709	
Contingency		25%	317,731	
Health and safety		3%	38,127	
Confirmatory sampling	60 samples	300/sample	18,000	
Total Cost			$1,784,584	
13. ONSITE INCINERATION OF SOILS IN EXCESS OF 10 PPM.				
Excavation	1,320 tons	$175/ton	$231,000	18 days
Incineration	1,320 tons	750/ton	990,000	30 days
Mobilization/ demobilization pilot testing		150,000	150,000	
Repaving	7,600 sq.ft	3/sq.ft	23,000	4 days
Engineering		10%	139,400	
Bonds and insurance		1%	13,940	
Contingency		25%	348,500	

HRC 001 1219

TABLE 6-2
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Remedial Alternative Costs

Method of treatment	Quantity	Unit cost	Subtotal	Approximate treatment time[1]
13. ONSITE INCINERATION OF SOIL IN EXCESS OF 10 PPM. (continued)				
Health and safety		3%	41,820	
Confirmatory sampling	60 samples	300/sample	18,000	
Total Cost			$1,955,660[6]	
14. OFFSITE INCINERATION OF SOILS IN EXCESS OF 10 PPM.				
Excavation	1,320 tons	$175/ton	$ 231,000	18 days
Incineration	1,320 tons	1,600/ton	2,112,000	
Repaving	7,600 sq.ft	3/sq.ft	23,000	4 days
Engineering		10%	236,600	
Bonds and insurance		1%	23,660	
Contingency		25%	591,500	
Health and safety		3%	70,980	
Confirmatory sampling	60 samples	300/sample	18,000	
Total Cost			$3,306,740	

HRC 001 1220

TABLE 6-2
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Remedial Alternative Costs

FOOTNOTES

1/ No allowance is made for regulatory approvals and other offsite mobilization activities.
2/ Replacing: cost for replacement of either security measures or containment system, once during 30 years; lifespan is assumed at 15 years.
3/ Price is estimated based on USEPA figures (Carpenter, B.H.; PCB sediment decontamination - technical/economical assessment of selected alternative treatments; EPA/600/52-86/112, March 1987).
4/ Price includes mobilization, demobilization and pilot testing, however, it assumes continued operation after testing. Interruption causing demobilization and remobilization after testing evaluation would increase total cost by about $100,000.
5/ Assumes ash is non-hazardous and can be redeposited onsite or at a non-TSCA landfill. If ash is hazardous, the total cost of this alternative could increase by $200,000.
6/ Assumes ash is non-hazardous and can be redeposited onsite or at a non-TSCA landfill. If ash is hazardous, the total cost of this alternative could increase by $300,000.

HRC 001 1221

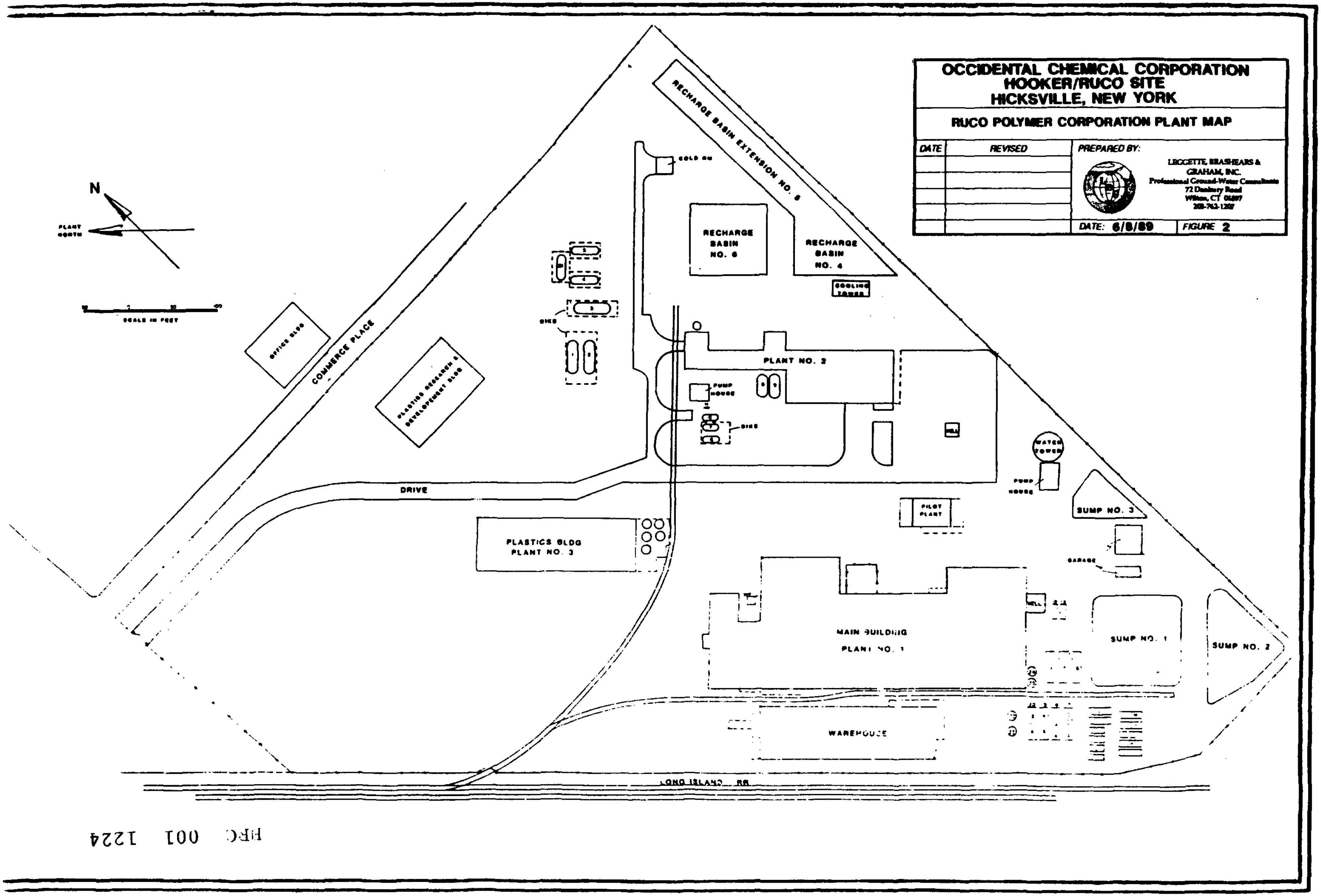
FIGURES

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

SITE LOCATION MAP

DATE	REVISED	PREPARED BY:
		LEGGETTE, BRASHEARS & GRAHAM, INC. Professional Ground-Water Consultants 72 Danbury Road Wilton, CT 06897 203-762-1207
		DATE: 6/8/89 FIGURE 1

HRC 001 1223



OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK
RUCO POLYMER CORPORATION PLANT MAP
DATE
REVISED
PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water Consultants
DATE: 6/8/89
FIGURE 2
N
PLANT NORTH
SCALE IN FEET
OFFICE BLDG
COMMERCE PLACE
DRIVE
RECHARGE BASIN EXTENSION NO. 5
RECHARGE BASIN NO. 6
RECHARGE BASIN NO. 4
COOLING TOWER
PLANT NO. 2
PUMP HOUSE
WATER TOWER
PILOT PLANT
SUMP NO. 3
GARAGE
PLASTICS BLDG PLANT NO. 3
MAIN BUILDING PLANT NO. 1
SUMP NO. 1
SUMP NO. 2
WAREHOUSE
LONG ISLAND RR

APPENDIX

HRC 001 1225

THERMODYNAMICS CORP.

FORMERLY INCINEREX CORPORATION, NY MOBILE HAZARDOUS WASTE INCINERATION

P.O Box 369, Bedford Hills, NY 10507 tel: (914)666-6066 fax: (914)241-4470

March 29, 1989

LEGGETTE, BRASHEARS & GRAHAM
RECEIVED
APR 0 3 1989

Mr. Dan St. Germain
LBG
72 Danbury Road
Wilton, CT 06897

Dear Mr. St. Germain:

Thank you for your inquiry. Enclosed is our general brochure which describes our mobile incineration system and services. If I can provide you with any further information on a particular application, please don't hesitate to call.

Very truly yours,

Gary Kyme
Engineering Director

HRC 001 1226

SYBRON

SYBRON CHEMICALS INC.

2/20/89

SUBJECT: ABR-SYSTEMS

DEAR MR.

Sybron Biochemical is the largest and most accomplished bioaugmentation company. Our technical center is in Salem, Virginia and corporate headquarters in Birmingham, N.J.

Costs are based on services, design, microbiology, and chemical products. For excavated soils we invoice on a per cubic yard basis and for insitu projects our costs reflect products, hardware, service, and maintenance.

In addition to field remediation, Sybron performs laboratory feasibility studies for both lab and pilot scale systems.

We trust the enclosed information is adequate and look forward to additional communications. Thank you for your inquiry.

Most Sincerely,

Gary R. Hater

Manager Soil & Groundwater
Treatment Technology

800-654-6952 MARKETING

800-678-0020 TECHNICAL CENTER

513-574-9722 G. R. Hater

HRC 001 1227

THERMODYNAMICS CORPORATION

MOBILE HAZARDOUS WASTE INCINERATION

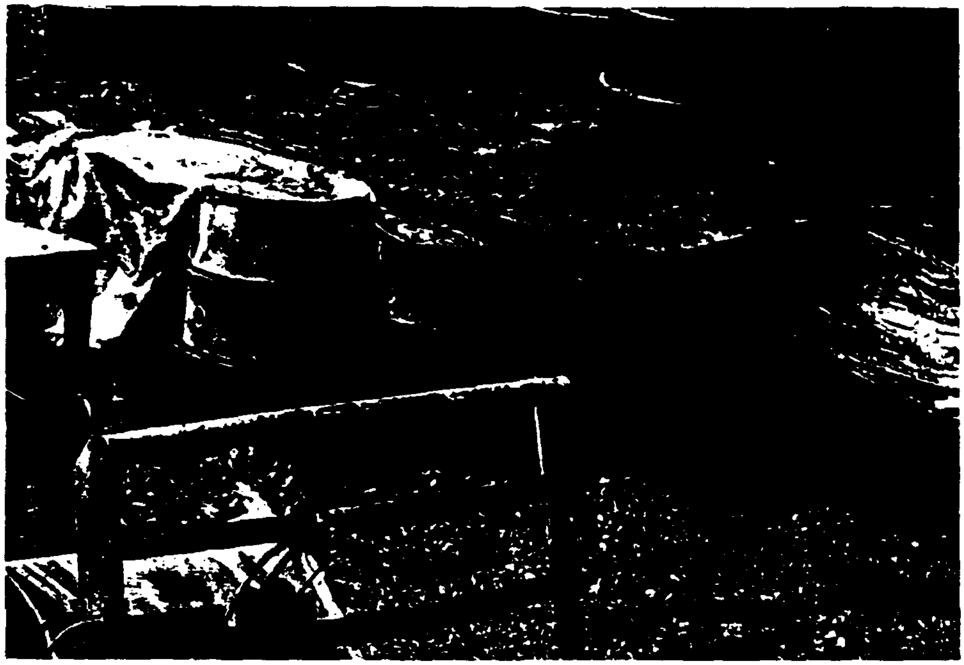
HRC 001 1228

Thermodynamics Corporation
P.O. Box 369
Bedford Hills, NY 10507

phone: (914)666-6066
fax: (914)241-4470

THERMODYNAMICS CORPORATION

HAZARDOUS WASTE INCINERATION



Typical Hazardous Waste Site

Society today demands a wide range of products, the manufacture of which results in the inevitable production of waste. Large amounts of organic chemical wastes are produced, which because of their persistence, toxicity, or carcinogenicity cannot be discharged into the environment and must be destroyed.

At present, the only practical large scale method for destroying these wastes is high temperature incineration.

The disadvantage of fixed sites is that hazardous waste must be transported to the incinerator, which can constitute a problem in itself. Therefore, Thermodynamics Corporation has adopted the concept of using mobile incinerators for the cleanup of abandoned dumps.

Since 1950 nearly **six billion tons** of toxic waste materials have been dumped on the land or buried in it. The potential for exposure to disease causing chemical wastes has been increasing every year.

In 1976 Congress passed the Resource Conservation and Recovery Act directing the Environmental Protection Agency to regulate hazardous waste. By October of 1984 the EPA had designated 786 hazardous waste sites targeted for cleanup and, alarmingly, estimated that the final list could reach nearly 2,500. Planning to clean up these toxic pools and contaminated landfills unearthed a new dilemma. How do you transport industrial wastes to treatment plants when communities along the way lobby to detour around their neighborhoods?

The need for thermal destruction on site becomes increasingly evident.

In reality hazardous dumps have been moved from one location to another, often creating new toxic sites in the process. Reports of leaking and leaching landfills abound. So-called secured landfills are leaking much sooner than expected. To put it simply **there is no such thing as a safe landfill.** Some 87% of the repositories now in use are in danger of leaking their toxic contents into the environment, thus prolonging America's toxic legacy.

Measured only in annual terms, storage will always seem to be less expensive than the destruction of toxic waste. But the time has come to realize that the long term expense and growing hazard of constantly shuffling storage sites poses monumental long term costs, both to the Federal budget and to human health.

America does have an alternative: the implementation of innovative technology to safely and permanently destroy toxic waste. There must be a shift away from storage of toxic waste and a resultant demand for the services of high technology companies that can provide a **permanent solution by completely destroying these wastes through high temperature incineration.**

Given the alternatives, we believe environmental regulations will favor incineration over storage or landfill. Using mobile incinerators will allow the effective destruction of the most potent organic chemical wastes at their point of origin, eliminating dangerous transportation and the danger inherent in the almost certain leaching from landfill sites.

Our mobile incinerator destroys toxic liquids, oily sludges and soils contaminated with PCB's. Independent tests under the supervision of the EPA have demonstrated that at temperatures up to 2,500 degrees Fahrenheit our mobile incinerator reduces wastes to harmless carbon dioxide and water vapor, while meeting EPA standards for Destruction and Removal Efficiency (DRE) and partic ulate emissions.

MOBILE HIGH TEMPERATURE INCINERATION

The system was specially designed for efficient on site disposal.Our mobile units not only destroy hazardous waste, but in the process solve many of the related problems:

**Elimination of transportation hazards. Incinerating wastes on site will remove the threat of accidents during transport.*

**An EPA approved process. The mobile system is controlled and monitored to conform to the EPA's stringent emission standards.*

**Multiple site clean up with a single unit. It is moved from site to site, ensuring cost effective disposal.*

**Reduction of land reclamation. Destroying chemical wastes in situ will eliminate andfill dumping and burial and the high cost of reclaiming land sites.*

Our high temperature mobile incineration unit was **designed specifically for the detoxification of hazardous waste.** Every component piece of equipment in the unit was engineered with the safe, effective and total destruction of hazardous wastes in mind. The process consists of five main steps:

FEEDING

Waste materials are loaded into the rotary kiln by using specialized feeding systems for different kinds of waste.

Incinerator in Transportation Mode.

HRC 001 1230

PROCESS FLOW DIAGRAM:

APPLICATIONS FOR MOBILE INCINERATION

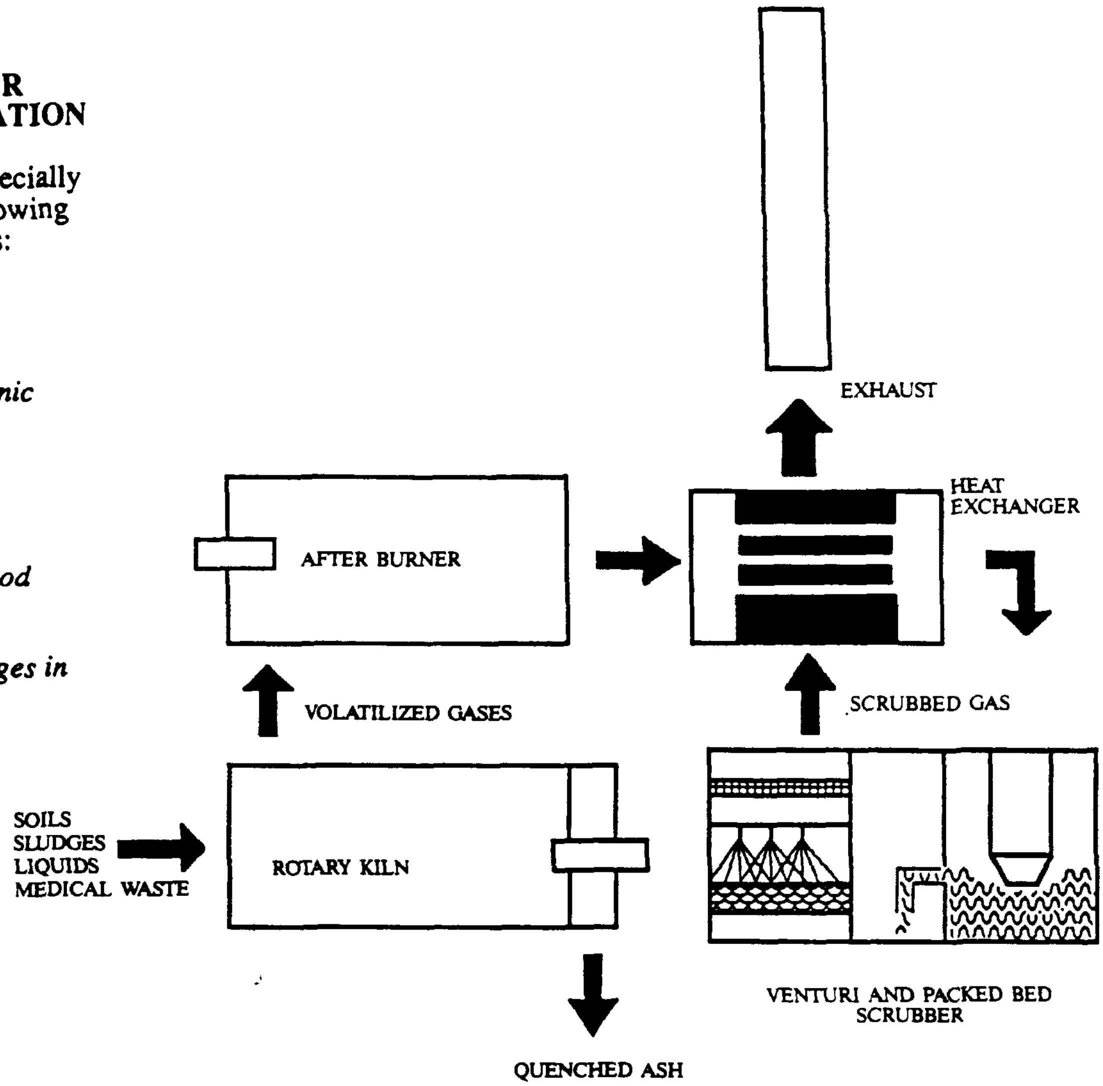
The mobile unit is especially well suited for the following clean up problem areas:

* *The treatment of abandoned dump sites contaminated with oil, PCB's and other organic compounds.*

* *The treatment of ammunition dumps.*

* *The effluent from wood processing plants.*

* *The cleaning of sludges in oil tanks.*



INCINERATION

Thermal decomposition is the heart of the mobile system. In the first stage of incineration wastes are heated up to 1,500 degrees Fahrenheit to ignite all combustible compounds.

AFTERBURNING

During the second stage burnt gases pass into the afterburner chamber and are further oxidized at up to 2,500 degrees F with a **2.5 second retention time.**

SCRUBBING

After pre-cooling, the exhaust gases enter the venturi scrubber in which the combusted products are chemically neutralized with caustic soda. Larger particulates are removed by the swirling action of the venturi; smaller particles are removed by the packed bed scrubber.

EXHAUST

After final scrubbing moisture is reduced in the gases by the demister, to reduce steam plume. The exhaust fan draws the final, clean gases up the 40 foot stack into the atmosphere. These gases then consist of **nothing more than harmless carbon dioxide and water vapor.**

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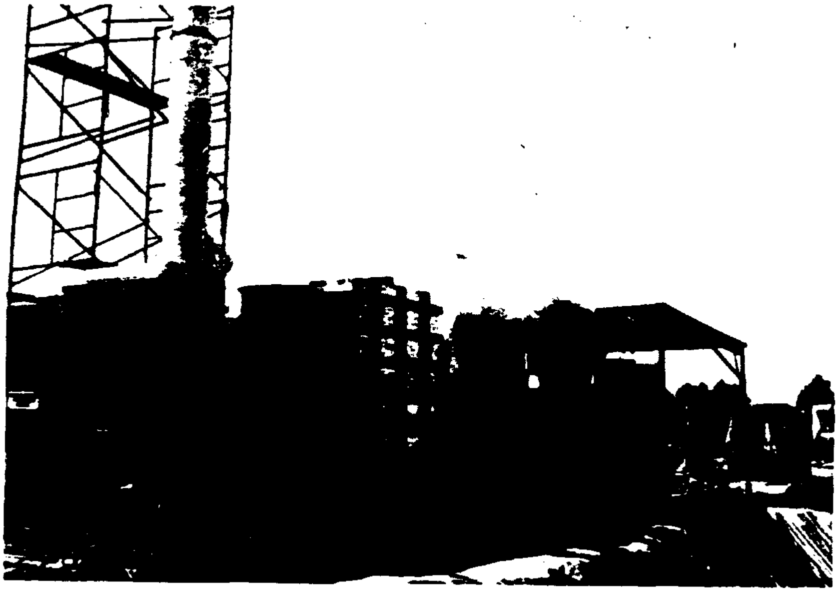
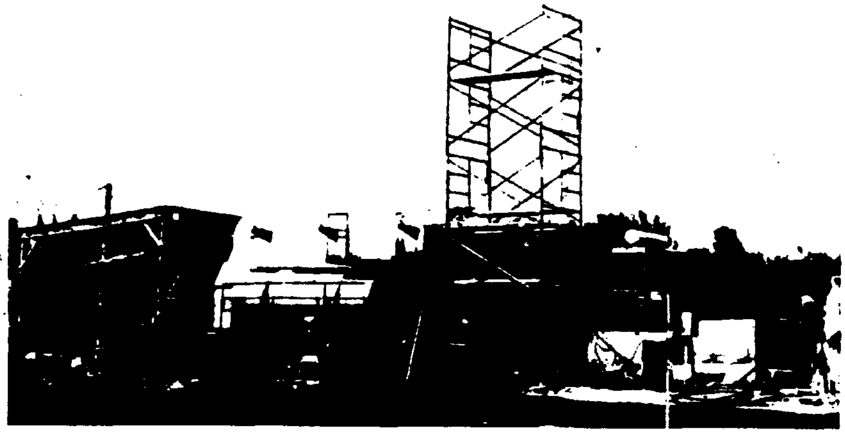


Incinerator Setup.



Incinerator in operation at superfund site in DelRay Beach, Florida.

Close-up of incinerator.

THERMODYNAMICS CORP.

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THERMODYNAMICS CORP.

I. Company Overview

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THERMODYNAMICS CORP.

Overview:

Thermodynamics Corporation is an environmental services firm specializing in on-site incineration of hazardous wastes. We believe that high temperature thermal destruction is the only practical method available today for treating the large amounts of hazardous organic wastes that have been dumped, legally or illegally, in the past and which continue to be generated by industry. Further, the obvious risk involved with transporting hazardous materials gives impetus for the treatment of wastes at the source. For these reasons Thermodynamics Corporation has adopted the concept of operating mobile incineration systems.

Of primary importance in selecting a treatment for hazardous wastes are the following:

1.) safety
2.) effectiveness
3.) efficiency

While safety and effectiveness are obviously the most important considerations in a remediation operation they are not enough to assure the commercial viability of a technology. Unfortunately, limited resources make cost considerations a major factor even where the preservation of our environment is concerned. The magnitude of our hazardous waste problem requires technologies which can effect quick, permanent solutions at a minimal cost.

Using proven rotary kiln technology, our mobile incinerators will handle solids, liquids, sludges and combinations of all three. Supported by our staff of engineers, technicians and operators our units process contaminated material around the clock. Our first system in commercial operation is mounted on a single 45 foot trailer and can be set up and ready to process contaminated material within 24 hours after arrival on site. This quick response time together with a utilization efficiency approaching 90% make this unit quite competative with much larger, and more conspicuous, multitrailer systems boasting greater throughput capacities.

Applications include:

*destruction of organic wastes in soils, sludges, liquids
*waste oil
*medical waste

II. The Incineration Process

INCINERATOR DESCRIPTION

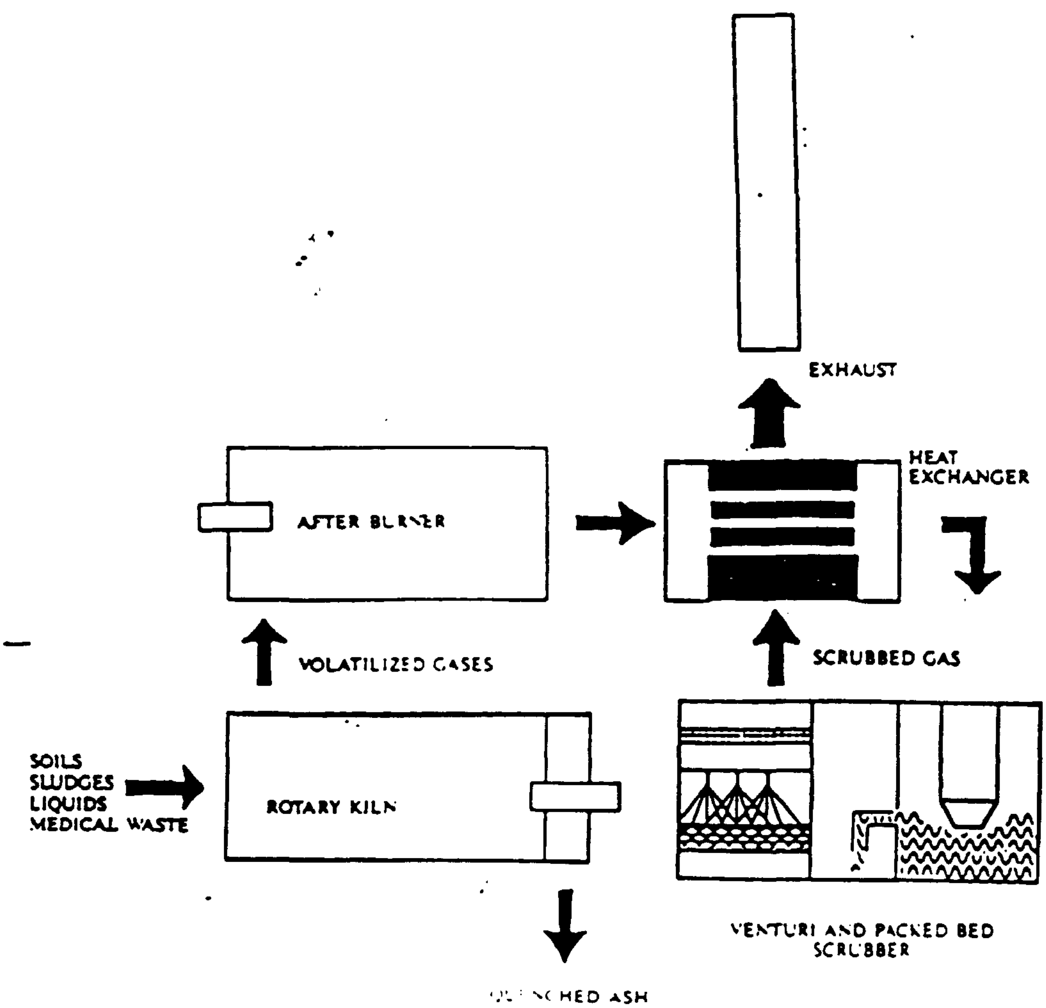
Waste materials are loaded into the revolving ignition chamber,using an auger feeder for solids, a progessive cavity pump for sludges and a gear pump for liquids.

In the first stage, the wastes are raised to temperatures as high as 1600°F, releasing all volatiles and igniting all combustible compounds.In the secondary combustion chamber burned gases are raised to temperatures as high as 2400°F in an oxygen rich atmosphere to assure complete oxidation. Residence time is on the order of 2.5 seconds.

After passing through the flue gas cooler, the exhaust gases enter the scrubbing system in which the acid gases are chemically neutralized with a caustic solution. Particulates are removed primarily by the venturi scrubber.

Excess moisture is removed by the demister, and the gases pass back through the flue gas cooler to be reheated in order to reduce steam plume. The clean gases are then drawn through the exhaust fan to the 40 foot stack and the atmosphere.

PROCESS FLOW DIAGRAM:



HRC 001 1237

THERMODYNAMICS CORP.

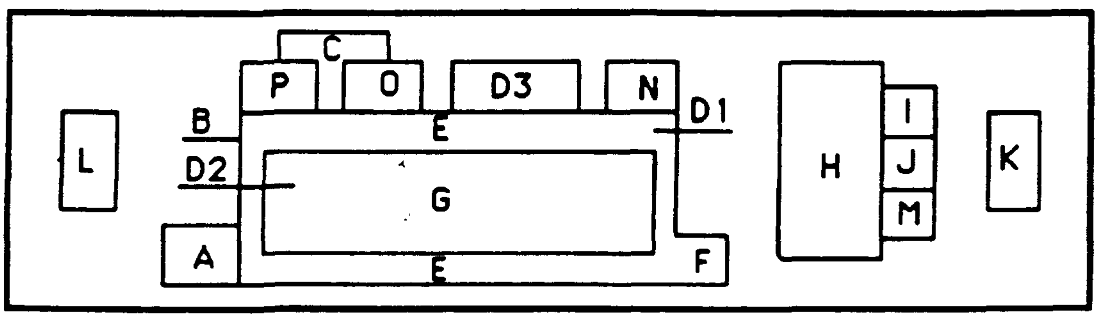
DESCRIPTION OF ON-SITE THERMAL DESTRUCTION FACILITY

INTRODUCTION

By burning and thermal decomposition, the Model INX-09 mobile incineration system is capable of disposing of liquids, sludges, solids and combinations of all three.

For operation, the trailer will be positioned in the operational mode on a level, firm foundation - preferably, a concrete pad. For transporting, the components are positioned in the travel mode, and the trailer is hitched to a suitable tractor to be driven to the next location.

The following sketch shows the approximate location of the components on the trailer.



A. Auger feeder
B. Progressive cavity pump
C. Gear pump
D. Auxiliary fuel feed system
D1 RIC burner
D2 CC burner
D3 Combustion air blowers
E. Revolving ignition chamber
F. Auger ash conveyor
G. Combustion chamber

H. Scrubbingsystem
I. Exhaust fan
J. Exhaust stack
K. Electric generator
L Instrument panel No.1
M. Instrument panel No.2
N. Instrument panel No.3
O. Instrument panel No.4
P. Instrument panel No.5

SYSTEM COMPONENTS

The Model INX-09 mobile incineration system consists of a mobile incinerator, an auxiliary personnel trailer and portable auxiliary equipment. The incineration system main components are as follows:

WASTE FEED SYSTEM
Auger feeder
Progressive cavity pump
Gear pump
AUXILIARY FUEL FEED SYSTEM
REVOLVING IGNITION CHAMBER
AUGER ASH CONVEYOR
COMBUSTION CHAMBER
SCRUBBING SYSTEM
Flue gas cooler/reheater
Venturi scrubber
Packed bed scrubber
Water conditioning system
EXHAUST FAN
EXHAUST STACK
ELECTRIC GENERATOR
INSTRUMENT PANELS
COMPUTER BASED MONITORING AND CONTROL SYSTEM

All components are mounted on an eight foot wide, forty-five foot long low-bed trailer specifically designed for heavy loads. This trailer includes air ride suspension and hydraulic leveling capabilities for easy transport to and set-up at the disposal site.

The auxiliary personnel trailer serves as a mobile office, containing the system control computer, calibration tools for the analytical equipment, and supplies.

Some additional auxiliary equipment may be required, depending on specific site requirements, such as an auxiliary fuel tank, scrubber water sludge settling facilities and various material handling and weighing equipment.

The only utility required is water for the flue gas cooler/reheater and scrubber water system. Although the electric generator is capable of supplying all necessary power, it is desirable to have site lighting and the computer powered (or, at least, backed up) by a local utility. This method provides both safety and data loss prevention.

EQUIPMENT

WASTE FEED SYSTEM

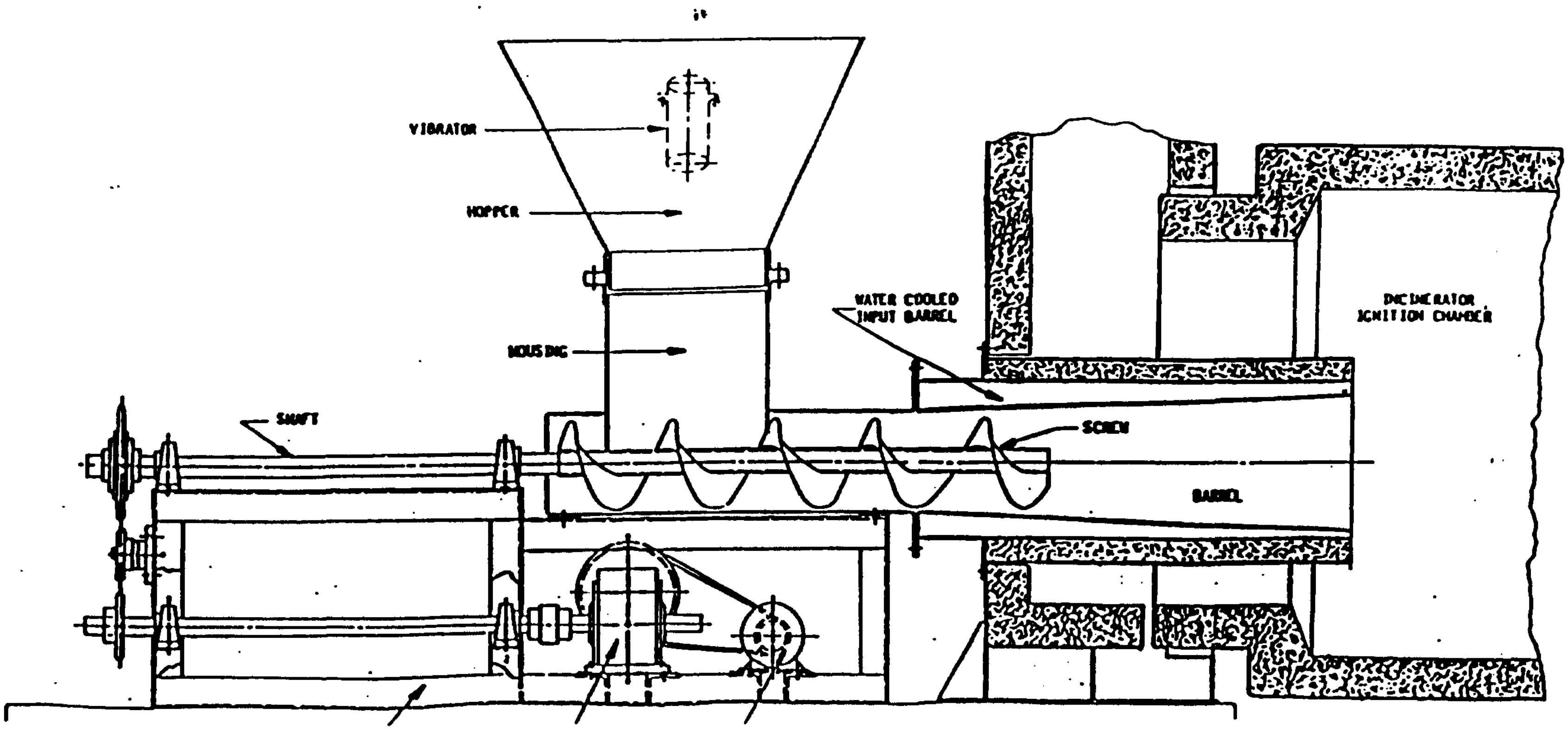
The waste feed system consists of a screw feeder, a progressive cavity pump and a gear pump. All feeding systems are interlocked with the incinerator and pollution control system monitoring instruments. Deviations from preset conditions will trigger an alarm and interrupt feeding.

The SCREW is enclosed within a fabricated steel BARREL which is enclosed within a WATER COOLED INPUT BARREL. This assembly is supported upon a structural steel BASE.

The HOPPER, with VIBRATOR, is located above the BARREL and is situated upon the HOUSING.

This assembly is driven by an ELECTRIC MOTOR with suitable GEAR REDUCER.

- The charge is deposited into the Feeder's Hopper.
- The Vibrator shakes the Hopper and forces the charge into the Housing.
- Located at the bottom of the Housing is a revolving Screw. As the Screw rotates, the charge is transported through the Barrel and into the Ignition Chamber for processing.



SCREW FEED SYSTEM

SCREW FEEDER

The screw feeder is used when feeding granular wastes, such as dirt, sand and heavy sludge into the revolving ignition chamber for processing.

All wastes which are to be fed with the screw feeder should be screened to a maximum of one (1) inch diameter. For large rocks, trees, drums and other oversize items a shredder may be required.

Waste is deposited into the hopper, located above the screw assembly. A vibrator, mounted on the side wall of the hopper, shakes the waste into the housing. The revolving screw, located below the housing, is enclosed in a fabricated steel barrel which is enclosed in a water-cooled input barrel. As the screw rotates, the waste is transported through the barrel and into the revolving ignition chamber.

PROGRESSIVE CAVITY PUMP

The progressive cavity pump is used when feeding light sludges and contaminated liquid waste into the revolving ignition chamber for processing. This pump has positive displacement characteristics and is suitable for feeding a wide variety of viscous materials as well as light liquids. This pump also can handle liquids containing a high percentage of solid contaminents.

Waste enters the pump through the inlet which is connected to the liquid sludge container. This pump contains a single-helix shaped rigid rotor and a double-helix shaped flexible stator. The waste exits the pump through the outlet which is connected to the feed nozzle protruding into the revolving ignition chamber.

GEAR PUMP

The gear pump is used when feeding clean liquid waste into the revolving ignition chamber for processing. Utilizing combustible liquids instead of, or as a supplement to, auxiliary fuel may substantially reduce auxiliary fuel costs.

The liquid waste enters the high pressure pump through the inlet which is connected to the storage container. The waste exits the pump through the outlet and enters the burner nozzle (combustible liquids) or atomizing nozzle (noncombustible liquids) which protrudes into the revolving ignition chamber.

REVOLVING IGNITION CHAMBER

In the Revolving Ignition Chamber (RIC) wastes are heated as high as $1600^{\circ}F$, releasing all volitiles and igniting all combustible compunds. The rotation of the refractory lined chamber exposes new surfaces, ensuring complete destruction of wastes in solid media. The "clean" ash is removed via the Ash Auger, volitilized gases exit to the Combustion Chamber (CC).

AUGER ASH CONVEYOR

The Auger Ash Conveyor transfers ash from the discharge end of the Revolving Ignition Chamber (RIC) to suitable ash containers for final disposal.

Two large screws, one into the discharge end of the Revolving Ignition Chamber and the other up to the ash container, are enclosed in a water-cooled housing and driven by an AC motor and suitable reducer.

As the screws rotate, ash is collected from the discharge and transferred to suitable containers.

COMBUSTION CHAMBER

The Combustion Chamber (CC) completes oxidation of the volatile gases resulting from the thermal process in the Revolving Ignition Chamber.

This chamber is fabricated from rolled steel plates and lined with a high temperature medium density castable, secured to the chamber by alloy steel anchors.

A refractory-lined duct directs the flow of volatile gases resulting from the thermal process in the Revolving Ignition Chamber to the preheated Combustion Chamber for complete oxidation. This chamber operates at a higher temperature than the Ignition Chamber; 1600°F to 2400°F, depending on the material being processed. The combustion air blower ensures sufficient excess air is present within the chamber to complete oxidation of combustible components. The CC burner is positioned so that the incoming gases and particulate pass through the high velocity excess air flame. The direction of the flame assures a swirling, vortex action which provides maximum turbulence and residence time to the burning mass.

SCRUBBING SYSTEM

The Scrubbing System is designed to conform with EPA requirements for emission levels while disposing of hazardous wastes. This high efficiency system includes a Flue Gas Cooler/Reheater, Venturi Scrubber and Packed Bed Scrubber.

FLUE GAS COOLER/REHEATER

The Flue Gas Cooler/Reheater precools the hot gases from the Combustion Chamber before scrubbing to increase scrubbing efficiency. It also reheats flue gases to temperatures above their dew point before exhausting into the atmosphere to eliminate condensation in the exhaust fan and stack and reduce steam plume.

There are two integral indirect heat exchangers. The flue gas to water exchanger cools the incoming hot gases from the Combustion Chamber prior to scrubbing. The flue gas to flue gas exchanger reheats the flue gases after scrubbing and prior to exhausting into the atmosphere.

The hot flue gases from the combustion process pass through the Precooler section and exchange heat with the cool water. The precooled gases travel through the transfer duct into the Venturi Scrubber.

The flue gases exiting the Packed Bed Scrubber are drawn through the Reheater section and exchange heat with the incoming warmer flue gases. The reheated gases exit through the exhaust stack and into the atmosphere.

VENTURI SCRUBBER

The PV Scrubber removes pollutants from flue gases and releases them into the scrubber solution.

The precooled flue gases exiting the Flue Gas Cooler/Reheater enter the Venturi Scrubber and travel downward through the intake tube which is centrally located within the scrubber housing. At the base of the intake tube is the venturi assembly, partially immersed in the scrubber solution. Process gases travel through the venturi and aspirate solution. Pollutants are removed from the gases and released into the solution which, induced into a rotary motion, acts as a centrifuge. The moist gases then flow through the centrifugal demister where the solution and gases are separated again. The solution, containing particulate, flows back into a settling chamber and the gases are drawn into the Packed Bed Scrubber.

PACKED BED SCRUBBER

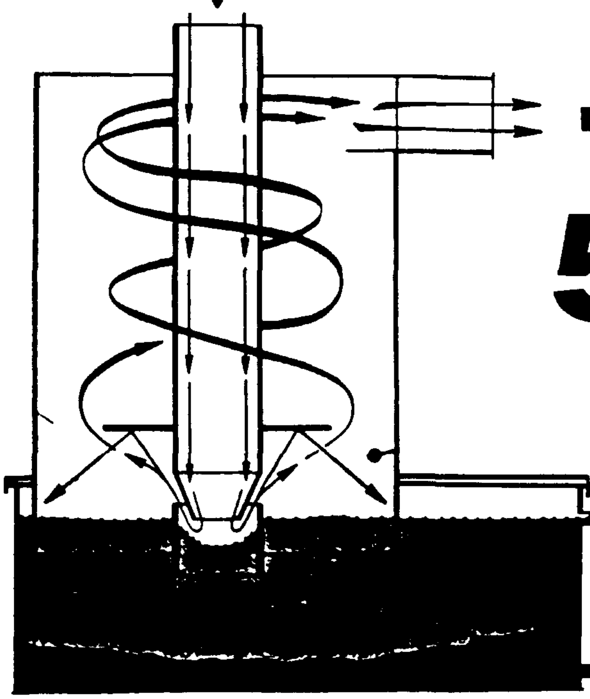
The Packed Bed Scrubber absorbs solution soluble gases and submicron particulates.

The gases exiting the Venturi Scrubber enter the base of the Packed Bed Scrubber and travel upward through the packed tower. Solution is continuously sprayed on the packing, neutralizing the gases as they flow upward against the solution. The large contact areas between the water and the gases, together with a relatively long retention time in the packed tower accomplish maximum absorption of solution soluble gases and submicron particulate. The clean gases pass through a demister to eliminate moisture prior to entering the Reheater section of the Flue Gas Cooler/Reheater .

OPERATION

1 Process gases enter the PV SCRUBBER thru the intake tube and travel downward.

2 A venturi assembly, located at the bottom of the tube, is partially submerged in the water. Process gases travel thru the venturi and aspirate water. The scrubbing process takes place here, on the water level; eliminating the need to pump water from one level to another. As a result, energy is saved.

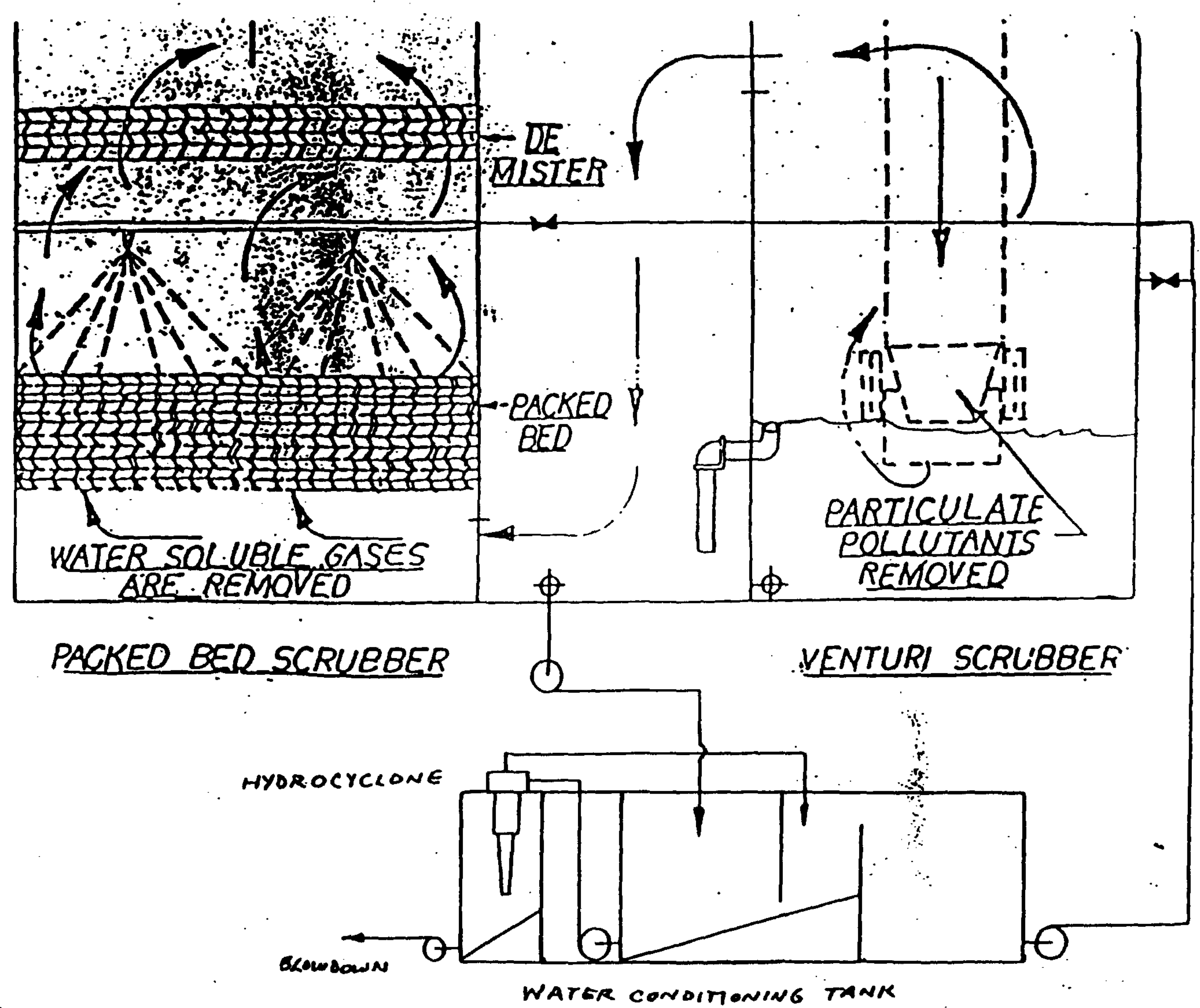


3 During operation, the pollutants are removed from the gases and released into the water contained within the reservoir. This water is induced into a rotary motion and acts as a centrifuge.

4 The solid particles, contained within the water, settle at the bottom of the reservoir. Periodically, the accumulated sludge (particulate) must be drained from the scrubber through its bottom port.

5 The moist gases flow through the centrifugal demister where the water and gases are separated again. The water flows back into the reservoir.

6 The exhaust fan draws the clean effluent upward, around the outside of the intake tube walls and through the exhaust stack for final exhaust into the atmosphere.



AIR QUALITY CONTROL SYSTEM

HRC 001 1245

WATER CONDITIONING SYSTEM

During scrubber operation, the solution must be maintained neutral. The Water Conditioning System recirculates the solution, monitors its pH level and adds caustic when necessary. The Water Conditioning System is not mounted on the trailer. It is delivered to the site separately and set up in a convenient location.

EXHAUST FAN

A stainless steel centrifugal fan, enclosed in a steel shroud, is mounted between the Flue Gas Cooler/Reheater and Exhaust Stack. It is connected through belts and pulleys to an AC motor and creates the induced draft through the system.

EXHAUST STACK

A stainless steel hydraulically operated Exhaust Stack including EPA test ports, directs the flow of clean exhaust gases to the atmosphere. A hydraulic cylinder lowers the stack for transport and raises it during set up at the disposal site.

ELECTRIC GENERATOR

The diesel powered, 100 KVA, Kohler generator is located at the front of the trailer before the exhaust fan and motor assembly. This generator is capable of providing electricity for the entire system.

THERMODYNAMICS CORP.

PROCESS MONITORING AND CONTROL

We feel that operator understanding and interaction with the system are of key importance for ensuring a safe, effective operation. The attempt to computerize and automate every process is, in many cases, just bad engineering practice; a gratuitous use of electronics serves only to complicate the operation, ultimately making the system less controlable and certainly less servicable.

Thermodynamics Corp. uses well trained operators supported by a judiciously designed monitoring and control system. Our operators are trained in the calibration, maintenance and, to the greatest extent possible, repair of all on board instrumentation; increased user servicablity allows greater operator cognizance and reduces downtime.

All vital process parameters, including waste feed rates, combustion temperatures, scrubber conditions and stack emissions are continuously monitored and recorded by an on-board, Yokagawa 30 channel microprocessor based chart recorder. With an LED readout and multicolor charting, this instrument provides a continuous record of operation and serves the operator with useful trend information.

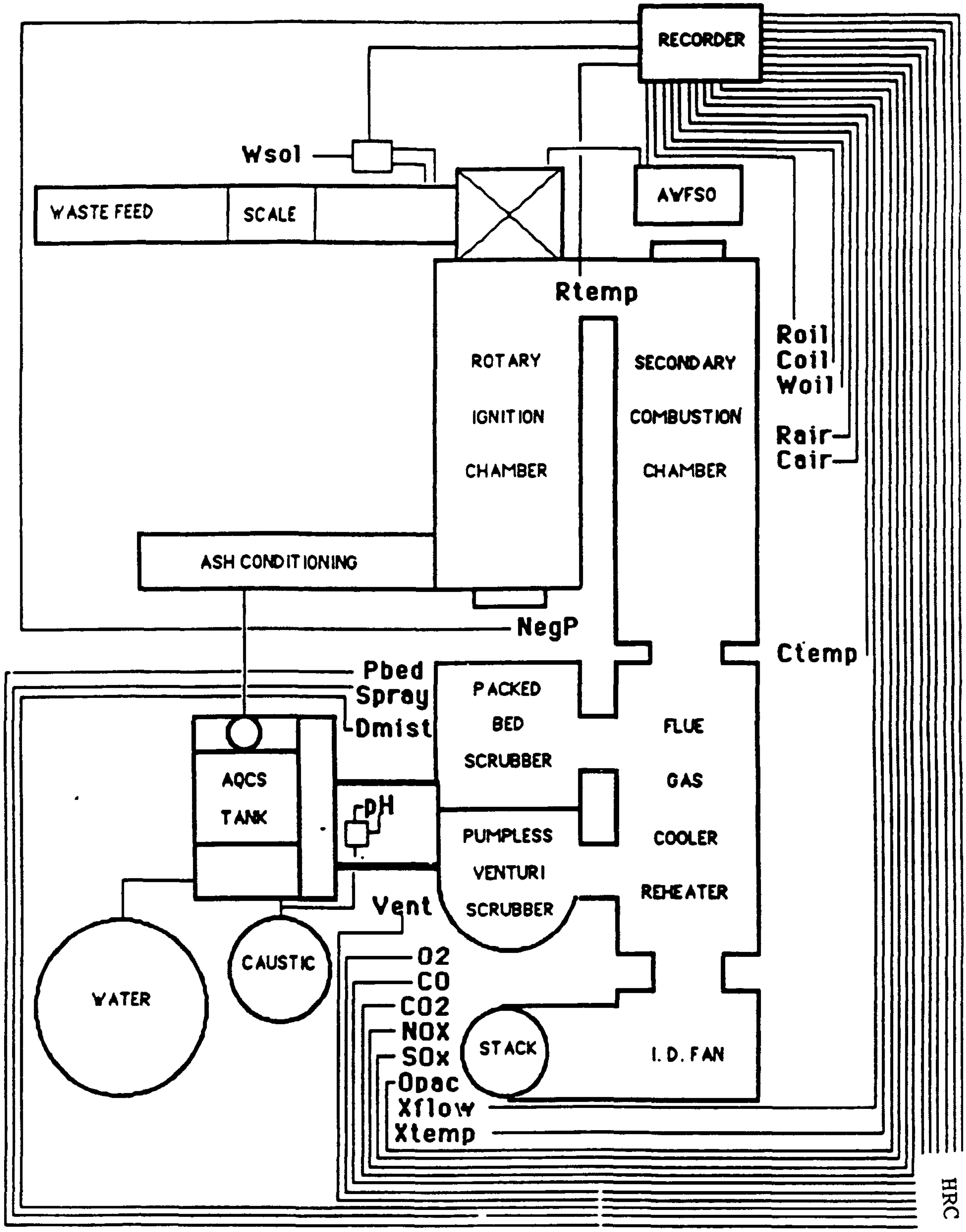
The chart recorder also has an internal relaying capability which is interlocked with the waste feed system; deviations from preset conditions in pollution control parameters will trigger an alarm and shut off feed.

As an additional safety feature, the auxilliary fuel burners are equiped with an independent Honeywell UV flame detection system which will automatically shut off fuel feed if the flame is lost.

Following is a list of process parameters which are monitored as well a schematic of the monitoring/control system:

PROGRAM CHANNELS

CHAN	PARAMETER	ACRONYM	CUTOFF	SENSOR RANGE
1	Carbon Dioxide	CO2	NS	0-15%
2	Oxygen	O2	<7%	0-25%
3	Carbon Monoxide	CO	>100 ppm	0-100 PPM
4	pH of Scrubber Solution	pH	<7.0	0-14
5	RIC Combustion Air Pressure	Rair	NS	0-100" WG
6	SCC Combustion Air Pressure	Cair	NS	0-100" WG
7	RIC Temperature	Rtemp	<1550 F	-150 to 2250 F
8	SCC Temperature	Ctemp	<1750 F	-150 to 2250 F
9	Exhaust Gas Temperature	Xtemp	NS	-150 to 2250 F
10	Exhaust Gas Flow	Xflow	NS	0-2" WD
11	System Negative Pressure	NegP	As spec	0-2" WG
12	RIC Oil Pressure	Roil	NS	0-15 psig
13	Solid Waste Feed Rate	Wsol	As spec	0-10,000 lb/hr
14	SCC Oil Pressure	Coil	NS	0-60 psig
15	Demister Pressure Drop	Dmist	NS	0-2" WD
16	Packed Bed Pressure Drop	Pbed	NS	0-2" WD
17	Venturi Pressure Drop	Vent	NS	0-20" WD
18	Packed Bed Spray Pressure	Spray	NS	0-100 psig
19	Waste Oil Feed Pressure	Woil	NS	0-15 psig
20	Nitrogen Oxides	NOx	NS	NS
21	Sulfur Oxides	SOx	NS	NS
22	Opacity	Opac	NS	NS
NS	Not specified			
RIC	Revolving Ignition Chamber			
SCC	Secondary Combustion Chamber			



SENSOR LOCATIONS

HRC 001 1249

III. Mobilization

MOBILIZATION
INX-09 MOBILE INCINERATOR

Travel of the incinerator will be during daylight hours only at the rate of about three hundred miles per day. With proper site preparation the system can be set up and ready to process material within 24 hours after arrival on site.

OPERATING PAD

Before the incinerator arrives on site an operating pad is required to provide a firm, level base for the system. The pad should be constructed of six inch thick mesh reinforced concrete, steel plates or compacted gravel.

ELECTRICAL

Approximately 200 Amps of 440 Volt 3 Phase current is required. If possible arrangements will be made with the local power company. The INX-09 is equipped with an integral 100KVA generator and is able to operate without outside utilities for extended periods. However, the best (and quietest) operating procedure is to operate from the local utility with generator backup.

AUXILIARY FUEL

Fuel requirements of this system range from zero to 37 gallons per hour of #2 Fuel Oil (depending on the amount of waste being processed and its fuel value) plus any fuel necessary for the generator. A 10,000 gallon fuel tank will be supplied. This will provide fuel storage for the incinerator, the electrical generator and any diesel pumps used on site.

WATER

Approximately 15 gallons per minute of fresh make-up water will be required for the heat exchanger and scrubbing system. Softening may be required to avoid build-up of calcium carbonate.

EQUIPMENT SET UP

1. The trailer containing the Moble Incineration System, and the Auxiliary Personnel Trailer and the water treatment tank are transported to the site and positioned on firm ground or on a concrete pad.

2. Disconnect tractor from trailer and level using trailer's leveling jacks.

3. Remove tie downs from Revolving Ignition Chamber.

4. Remove ash conveyor's trough and drive assembly from travel mode position. Insert trough into Revolving Ignition Chamber and bolt drive assembly to trough.

5. Connect No. 2 fuel oil lines to burner piping, connect propane tank to burner pilot lines.

6. Remove water conditioning pumps from travel mode position and set up wherever convenient for connection to water conditioning tank

7. Connect PV Scrubber and Packed-Bed Scrubber to water conditioning tank.

8. Connect feed and drain water lines to water conditioning tank, Flue Gas Cooler/Reheater, Screw Feeder and Auger Ash Conveyer.

9. Fill Flue Gas Cooler/Reheater, PV Scrubber and water conditioning tank to proper levels.

10. Connect electrical cable between main control panel on trailer and computer in auxiliary personnel trailer.

11. Connect generator fuel line.

12. Raise and secure Exhaust Stack.

13. Erect scaffolding against the stack to support test burn monitoring equipment.

IV. Test Burn Data

A: Pentachlorophenol and Hexachlorobenzene in soil; performed at SCS Superfund Site

B: Dichlorobenzene in #2 fuel oil (synthetic waste oil)

INCINERAX CORPORATION

TEST DATA
MOBILE INCINERATOR

incinerex corporation

CONFIDENTIAL

HAZARDOUS WASTE ELIMINATION

HRC 001 1254

ENTROPY

ENVIRONMENTALISTS INC

POST OFFICE BOX 12291
RESEARCH TRIANGLE PARK
NORTH CAROLINA 27709-2291
919-781-3550

STATIONARY SOURCE SAMPLING REPORT

REFERENCE NO. 5793

INCINEREX CORPORATION

DELRAY BEACH, FLORIDA

HAZARDOUS WASTE INCINERATION TESTING

INCINERATOR STACK

MAY 24 AND 25, 1988

HRC 001 1255

REPORT CERTIFICATION

The sampling and analysis performed for this report was carried out under my direction and supervision.

Date July 26, 1988 Signature Tony Wong

Tony Wong

I have reviewed all testing details and results in this test report and hereby certify that the test report is authentic and accurate.

Date July 26, 1988 Signature Walter S. Smith

Walter S. Smith, P.E.

HRC 001 1256

ENTROPY

INTRODUCTION

1.1 Outline of Test Program. Stationary source sampling was performed for Incinerex Corporation, in Delray Beach, Florida on May 24 and 25, 1988. Testing was conducted at the incinerator stack. The purpose of the testing was to conduct a trial burn in accordance with the Resource Conservation and Recovery Act (RCRA) standards for the incineration of hazardous waste. Destruction and Removal Efficiencies (DREs) were calculated for two Principal Organic Hazardous Constituents (POHCs) in the waste feeds: pentachlorophenol and hexachlorobenzene.

1.2 Test Sets. The testing consisted of three test sets. Each test set consisted of one modified EPA Method 5, one EPA Modified Method 5, and one EPA Method 10 run. The first two test sets were performed on May 24 and the third was performed on May 25. All runs conducted during a test set were performed concurrently.

1.3 Waste Feeds and Process Samples. Pentachlorophenol spike, hexachlorobenzene spike, and soil samples were collected by Incinerex personnel. Scrubber makeup and discharge and ash samples were collected by Entropy Environmentalists, Inc. personnel during the trial burn. Refer to section 4.5 for sample collection locations. The samples were subjected to the appropriate chemical analyses; refer to Appendix B for the analytical results and Table 4-1 for a listing of the analytical methods.

1.4 Test Participants. Table 1-1 (on following page) lists the personnel present during the test program.

HRC 001 1257

TABLE 1-1

TEST PARTICIPANTS

Incinerex Corporation	Chris Christiphine Test Coordinator
	Melvin Hebert Test Coordinator
	Mark Wolstencroft Test Observer
	Jim Murphey Operator
	Gary Babin Operator
	Mario Morales Process Sample Collector
United States Environmental Protection Agency, Region IV	Paul Reinerman Test Observer
	Bill Klytz Test Observer
Entropy Environmentalists, Inc.	Tony Wong Project Supervisor
	A. Thomas McDonald Sampling Team Leader
	Barry F. Rudd Sampling Team Leader
	Steve T. Arthur Sampling Team Leader
	Richard L. Moreno Sampling Team Leader
	Steve J. Eckerd Engineering Technician
	John D. Eddy Laboratory Technician

SUMMARY OF RESULTS

2.1 Presentation. The results for the trial burn conducted for Incinerex Corporation are summarized in Tables 2-1 through 2-6. The overall summary of the trial burn, including the DREs for pentachlorophenol and hexachlorobenzene is presented in Table 2-1. Refer to the "List of Tables and Figures" in the Table of Contents for summary tables of all other results.

Refer to Appendix A for detailed test results. Field and analytical data is presented in Appendix B.

2.2 Discussion of Results

2.2.1 Destruction and Removal Efficiency (DRE). To meet RCRA standards, a hazardous waste incinerator must have a DRE of at least 99.99% for each designated POHC. In all cases, the incinerator met the RCRA requirement. During the testing, the DREs for pentachlorophenol and hexachlorobenzene exceeded 99.995% and 99.993%, respectively.

2.2.2 Particulate Emissions. The RCRA limit for particulate emissions is 0.08 grains/DSCF corrected to 7% oxygen. In all cases, the incinerator met the RCRA criteria for particulate emissions. The particulate concentration for runs 1, 2, and 3 were 0.0394, 0.0333, and 0.0277 grains/DSCF corrected to 7% oxygen, respectively.

2.2.3 Hydrogen Chloride (HCl) Emissions. Regulations require the HCl emissions to be no greater than the larger of either four pounds per hour or 1% of the HCl in the flue gas prior to entering any pollution control equipment. In all cases, the incinerator met the required limits. The emission rate for all runs was less than four pounds per hour. Also, the removal efficiencies for runs 1, 2, and 3 were 99.7%, 99.8%, and > 99.97%, respectively.

2.2.4 Carbon Monoxide Concentrations. The concentrations for runs 1, 2, and 3 were 0.35, 0.19, and 0.30 ppm expressed as carbon, respectively.

(continued on page 2-8)

TABLE 2-2

WASTE FEED RATES AND INCINERATOR DREs

Incinerator Stack

	Repetition 1	Repetition 2	Repetition 3
Waste Feed Rates			
Pentachlorophenol Spike, lb/hr	1	1	1
Hexachlorobenzene Spike, lb/hr	1	1	1
Soil Feed, Tons/hr	1.0047	1.0047	1.0047
Pentachlorophenol			
Total Inlet Feed Rate, lb/hr	0.910	0.900	0.904
Emission Rate, lb/hr	< 3.70E-06	< 3.68E-06	4.53E-05
DRE, %	> 99.9996	> 99.9996	99.995
Hexachlorobenzene			
Total Inlet Feed Rate, lb/hr	0.977	0.987	0.959
Emission Rate, lb/hr	6.96E-06	< 3.68E-06	6.98E-05
DRE, %	99.9993	> 99.9996	99.993
Hydrogen Chloride			
Waste Feeds, lb/hr			
Pentachlorophenol Spike	0.623	0.616	0.618
Hexachlorobenzene Spike	0.750	0.758	0.736
Soil Feed	0.789	0.740	0.690
Total Inlet Feed Rate, lb/hr	2.16	2.11	2.04
Emission Rate, lb/hr	0.00591	0.00383	< 0.000677
Removal Efficiency, %	99.7	99.8	> 99.97

TABLE 2-3
PARTICULATE AND HYDROGEN CHLORIDE
SUMMARY OF RESULTS

	M5-1	M5-2	M5-3	Average
Test Date	5/24/88	5/24/88	5/25/88	
Run Start Time	1345	1645	1000	
Run Finish Time	1449	1751	1106	
<u>Test Train Parameters</u>				
Volume of Dry Gas Sampled, SCF*	54.591	57.620	59.506	
Percent Isokinetic	93.0	92.6	91.4	
<u>Flue Gas Parameters</u>				
Temperature, Deg. F	161	160	156	159
Gas Flow Rates				
SCFM*, Dry	1,571	1,664	1,742	1,659
ACFM, Wet	2,525	2,613	2,695	2,611
Percent Excess Air	175.3	170.7	151.6	165.8
<u>Particulate</u>				
Concentration				
Gr/DSCF*	0.0208	0.0181	0.0160	0.0183
Gr/DSCF @ 7% O2	0.0394	0.0333	0.0277	0.0335
Emission Rate, lbs/hr	0.281	0.258	0.239	0.259
<u>Hydrogen Chloride</u>				
Concentration, ppmvd	0.663	0.405	< 0.0685	< 0.379
Emission Rate, lbs/hr	0.00591	0.00383	< 0.000677	< 0.00347

* 68 Degrees F — 29.92 Inches Mercury (Hg)

TABLE 2-5

WASTE FEEDS ANALYTICAL RESULTS

	Repetition Number		
	1	2	3
Feed Spikes			
Pentachlorophenol, wt/wt %	91.0	90.0	90.4
Hexachlorobenzene, wt/wt %	97.7	98.7	95.9
Soil			
Pentachlorophenol, mg/kg	< 5	< 5	< 5
Hexachlorobenzene, mg/kg	< 2	< 2	< 2
Organic Halogens as Cl, mg/kg	382	358	334

TABLE 2-6

SCRUBBER MAKEUP AND DISCHARGE AND ASH ANALYTICAL RESULTS

	Repetition Number 1	Repetition Number 2	Repetition Number 3
Scrubber Makeup			
Pentachlorophenol, ug/L	< 0.5	< 0.5	< 0.5
Hexachlorobenzene, ug/L	< 0.5	< 0.5	< 0.5
Scrubber Discharge			
Pentachlorophenol, ug/L	< 0.5	0.5	440
Hexachlorobenzene, ug/L	0.8	0.6	1.4
Ash			
Pentachlorophenol, ug/kg	5.9	< 1.0	2.7
Hexachlorobenzene, ug/kg	21	29	30

TABLE 2-4
PENTACHLOROPHENOL AND HEXACHLOROBENZENE
SUMMARY OF RESULTS

	MM5-1	MM5-2	MM5-3	Average
Test Date	5/24/88	5/24/88	5/25/88	
Test Train Parameters				
Volume of Dry Gas Sampled, SCF*	57.916	56.454	57.077	
Percent Isokinetic	103.0	103.6	100.7	
Flue Gas Parameters				
Temperature, Deg. F	160	164	160	161
Gas Flow Rates				
SCFM*, Dry	1,620	1,571	1,633	1,608
ACFM, Wet	2,604	2,506	2,550	2,553
Percent Excess Air	175.3	170.7	151.6	165.8
Pentachlorophenol				
Concentration, ppmvd	< 5.51E-05	< 5.65E-05	6.68E-04	< 2.60E-04
Emission Rate, lbs/hr	< 3.70E-06	< 3.68E-06	4.53E-05	< 1.75E-05
Hexachlorobenzene				
Concentration, ppmvd	9.69E-05	< 5.28E-05	9.64E-04	< 3.71E-04
Emission Rate, lbs/hr	6.96E-06	< 3.68E-06	6.98E-05	< 2.68E-05

* 68 Degrees F — 29.92 Inches Mercury (Hg)

PROCESS DESCRIPTION AND OPERATION

3.1 General. Incinerex Corporation operates a mobile incinerator for the destruction of solid hazardous waste in Delray Beach, Florida. Contaminated soil spiked with pentachlorophenol and hexachlorobenzene was fed to the incinerator during the test.

3.2 Source Flow Schematic. Figure 3-1 is an air flow schematic showing the passage of flue gases through the incineration system.

3.3 Operating Parameters. Process data provided by Incinerex Corporation is provided in Appendix D.

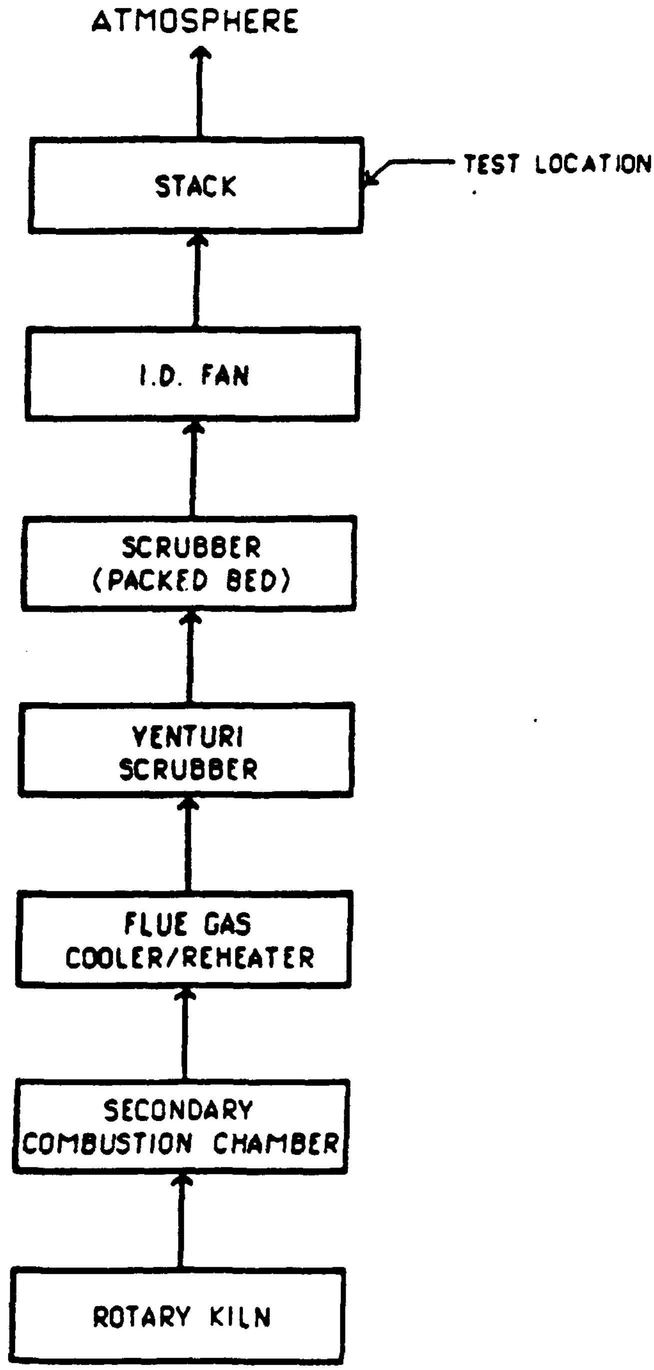


FIGURE 3-1. AIR FLOW SCHEMATIC SHOWING TEST LOCATION.

INCINEREX CORPORATION

TEST DATA
MOBILE INCINERATOR

INCINEREX CORP

CONFIDENTIAL

HAZARDOUS WASTE ELIMINATION

HRC 001 1267

INCINERATOR CORP
INX-09 MOBILE INCINERATOR
TEST BURN

CONFIDENTIAL

TRC Project No. 3692-E51

October 1986
Prepared by: J. Canora

STATE OF CONNECTICUT
EUGENE A. BRACKBILL
No. 12274
LICENSED
PROFESSIONAL ENGINEER

Eugene A. Brackbill

HRC 001 1268

1.0 INTRODUCTION

TRC Environmental Consultants was retained to provide emission measurement services for a demonstration burn of surrogate waste fuel in a INX-09 mobile incinerator. The Incinerex portable incinerator of the two- stage rotary combustor-type mounted on a flatbed trailer. The system is designed to thermally destroy combustible hazardous constituents, including polychlorinated biphenyls (PCB's), contained in either liquids, solids or sludges. The purpose of the emission test program was to demonstrate the ability of the incinerator to destroy a principal organic hazardous constituent (POHC) in a liquid waste feed and comply with EPA incinerator performance standards. Measurements performed on process streams, utilizing EPA reference and protocol methods, verified the unit to be in compliance with Federal regulations. Also demonstrated in this test burn was a quick set-up and preheat time for the incinerator which was cold-started at the beginning of each test day. Mechanical problems associated with the INX-09 were rare and minor which facilitated the completion of testing in three days.

Synthetic waste fuel was prepared by adding 10 gallons of dichlorobenzenes to 40 gallons of No. #2 fuel oil. Exact proportions were confirmed gravimetrically with a load cell. This waste fuel, containing 20 percent by volume of dichlorobenzenes as the POHC was the only waste feed utilized in this burn. Dichlorobenzenes are difficult to burn and are considered to be a good surrogate for polchlorinated biphenyls (PCB's). Ininceratur conditions were also held unchanged throughout the three days of testing. Kiln temperature was 950°c, secondary combustion chamber was 1200°c, excess air was 6-8% oxygen and scrubber water pH was maintained at 7-10.

Destruction and removal efficiency (DRE) was determined for the POHC by measuring dichlorobenzene in all process streams including waste fuel feed rate with a load cell, stack emissions of dichlorobenzene with EPA/ASME Modified Method 5 and analysis of the scrubber water for traces of unburned dichlorobenzenes. Since there was no solid fuel there was no incinerator bottom ash to analyse in this determination. Measured DRE was greater than 99.9999 percent efficient for three tests conducted. Particulate matter (PM), hydrochloric acid (HCL), carbon monoxide (CO), nitric oxides (NOx), oxygen (O_2) and carbon dioxide (CO_2) were also measured in the stack flue gas.

HCL emissions, generated from the combustion of chlorinated POHC's, were efficiently removed with the INX-09 close loop, pH controlled scrubber system. Each day of testing began with the scrubber treatment tank recharged with fresh water. A precisely known amount of chlorides entered the system from the waste and auxilliary fuels during the test. Chlorides exiting the system were measured in the stack exhaust. Scrubber water samples were also collected. Analysis of these samples accounted for the chlorides remaining in solution but neglected those which precipitated out of solution and either settled to the bottom of the treatment tank or were trapped in the filtering system. A chloride balance was incomplete without known composition of the filtrate and precipitate.

A summary and discussion of the test results is presented in Section 2 of this report. Section 3 contains a description the incinerator. Section 4 presents details of the sampling and analytical methods and Section 5 describes quality assurance procedures. Section 6 contains an outline of emission measurement calculations applied in this test program.

2.0 SUMMARY AND DISCUSSION OF RESULTS

Data summaries are presented in Table 2-1, 2-2 and 2-3 for DRE, Particulate and HCL Emissions and continuous Emission Monitoring (CEM), respectively.

2.1 DRE

DRE was measured to be 99.9999 percent efficient for all three tests conducted on September 18, 1986. Total feed rate of dichlorobenzene (DCB) was determined from the known composition of the synthetic waste and the fuel tank weight change recorded from the load cell at five minute intervals during the test. An average DCB feed of 19.5 pounds per hour was calculated from this data during the DRE testing.

Results from the gas chromatography/flame ionization detector (GC/FID) analysis of the extracts of three Modified Method 5 (MM5) tests performed at the stack and similar analysis of the scrubber water for dichlorobenzene determined the quantity of the waste POHC which was not destroyed in the incinerator. Both ortho and meta dichlorobezene emissions were detected in the stack with emission rates ranging from $.99 x 10^{-5}$ to $1.59 x 10^{-5}$ pounds per hour. All samples weee blank corrected. Dichlorobenzenes in the scrubber water were non-detected which corresponded to a rate of less than $.13 x 10^{-5}$ pounds per hour. Compared to the 19.5 lbs/hour of DCB's inputed to the incinerator, all tests demonstrated greater than 99.9999 percent DRE.

2.2 Particulates and HCL

Results fron three EPA Method 5 tests conducted on September 16, and 17, 1986, for particulates with the back half collected and analysed for HCL with the mercuric-nitrate titration, were all in compliance with EPA incinerator

TABLE 2-1

Destruction and Removal Efficiency (DRE) of Dichlorobenzene September 18, 1986

Test ID Time	Organic-5 1100-1200	Organic-6 1230-1330	Organic-7 1400-1440
Incinerator Conditions			
Kiln Temp (°F)	1675	1626	1601
Secondary Temp (°F)	2177	2191	2192
Dihlorobenzene Feed (lbs/hr)	19.5	19.5	19.5
Stack Conditions			
Temp (°F)	157	160	160
Moisture(%)	24.4	23.7	24.5
Oxygen (%-dry)	11.4	11.4	11.2
Volumetric Flow (DSCFM)	1420	1370	1380
Sample Conditions			
Volume (DSCF)	57.71	56.74	52.11
Dichlorobenzene Catch (μg)	4.90	4.77	2.83
Isokinesis (%)	99.5	101.2	102.4
Dichlorobenzene Emissions			
Concentration (lbs/DSCF)	1.87×10^{-10}	1.85×10^{-10}	1.19×10^{-10}
Rate (lbs/hour)	1.59×10^{-5}	1.52×10^{-5}	0.99×10^{-5}
Dichlorobenzene in Scrubber Water (lbs/hour)	$<0.13 \times 10^{-5}$	$<0.13 \times 10^{-5}$	$<0.13 \times 10^{-5}$
DRE(%)	99.99991	99.99991	99.99994

TABLE 2.2

HCL and Particulate Emissions
September 16 and 17 1986

Test ID	1	2	3
Date	9/16	9/16	9/17
Time	1215-1315	1350-1450	1120-1250
Incinerator Conditions			
Kiln Temp (°F)	1572	1608	1588
Secondary Temp (°F)	2162	2181	2147
Dichlorobenzene Feed (lbs/hour)	13.9	13.9	14.5
Stack Conditions			
Temperture (°F)	155	157	160
Moisture (%)	20.8	23.0	20.5
Oxygen (% dry basis)	12.6	11.2	10.9
Volumetric Flow (DSCF)	1490	1450	1590
Stack Conditions			
Volume (DSCF)	59.68	47.94	61.14
Particulate Catch (mg)	77.2	35.7	44.0
HCL Catch (mg)	2.52	1.16	1.29
Isokinesis	98.0	96.8	93.7
Particulate Emissions			
Concentration (Grains/DSCF corrected to 7% O_2)	0.033	0.017	0.015
Rate (lbs/hour)	0.254	0.143	.153
HCL Emissions			
Concentration (lbs/DSCF)	1.4×10^{-7}	$<1.0\times10^{-7}$	$<1.0\times10^{-7}$
Rate (lbs/hour)	.009	.005	.004

HRC 001 1273

TABLE 2.3

CEM Date Summary - NO_x, CO, CO_2 & O_2
September 16-18, 1986
Concentration[1]

Test No./Date	Time	NO_x (ppm)	CO(ppm)	CO_2(%)	O_2(%)
1-9/16/86	1215	No data	<1.0	9.5	8.1
	1225	"	"	9.4	8.1
	1235	"	"	9.4	8.1
	1245	"	"	9.4	8.1
	1255	"	"	9.6	8.0
	1305	"	"	9.6	7.8
2-9/16/86	1350	No data	<1.0	9.7	7.8
	1400	"	"	9.8	7.7
	1410	"	"	9.8	7.6
	1420	"	"	9.9	7.6
	1430	"	"	9.9	7.4
	1440	"	"	10.0	7.3
3-9/17/86	1120	No data	<1.0	9.6	7.4
	1130	"	"	9.8	7.1
	1140	"	"	9.7	7.1
	1150	"	"	9.9	6.7
	1200	"	"	10.2	6.2
	1210	"	"	9.9	6.4
	1220	"	"	9.6	6.6
5-9/18/86	1050	136	<1.0	11.7	7.5
	1100	123	"	12.2	6.3
	1110	119	"	11.8	6.7
	1120	122	"	11.9	6.6
	1130	122	"	11.9	6.5
	1140	118	"	11.6	6.7
6-9/18/86	1230	118	<1.0	11.7	7.0
	1240	118	"	11.4	7.1
	1250	118	"	11.4	7.1
	1300	118	"	11.2	7.3
	1310	118	"	11.0	7.4
	1320	111	"	10.8	7.6
7-9/18/86	1400	112	<1.0	10.8	7.4
	1410	114	"	10.6	7.5
	1420	112	"	10.3	7.6
	1430	114	"	10.4	7.9

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[1] All concentrations listed represent ten-minute averages beginning at the given time.

performance standards. Particulate emission concentration was .033, .017 and .015 grains per dry standard cubic foot (DSCF) for the three tests conducted. Compliance with the EPA Incinerator Performance Standard of .08 grains/DSCF corrected to 7% oxygen was met.

HCL emission rate measured .009, .005 and .004 pounds per hour for the three tests. This pollutant emission rate was also in compliance with the federal standard of 4.0 pounds per hour.

2.3 CEM

All CEM instruments measured concentrations in a flue gas sample drawn from a point in the exhaust system between the afterburner outlet and the scrubber inlet.

Carbon monoxide was non-detected over the entire burn. Detection limits of the CO analyser were determined to be 1.0 part per million. Analog strip chart recordings of the data, included in the Appendix, displays a steady reading of zero.

Carbon dioxide concentration ranged fron 9.4 to 12.2 percent and oxygen ranged from 6.2 to 8.1 percent.

Oxides of nitrogen were monitored only on September 18 and concentrations ranged from 111 to 136 parts per million.

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

CONCENTRATIONS OF PCB'S IN SOIL

DATE	REVISED

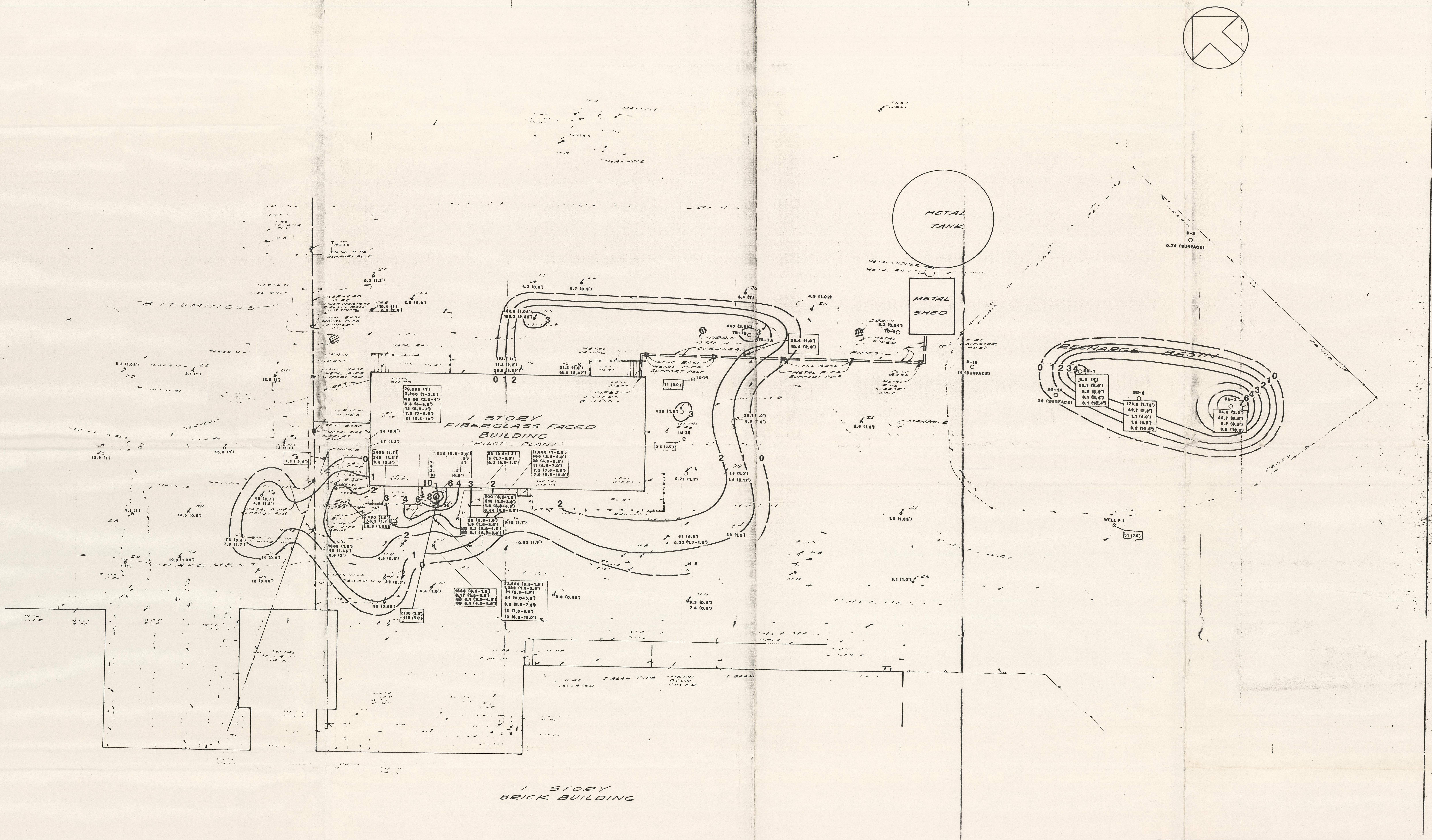
PREPARED BY:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water Consultants
72 Danbury Road
Wilton, CT 06897
203-762-1207

DATE:

PLATE 1

HRC 001 1276



LEGEND

METAL BUMPER

TEST BORING

TEST WELL

ND 0.1 NOT DETECTED AT THE STATED DETECTION LIMIT

CONCENTRATION OF AROCLOR (ppm)

2900 (1.1')

DEPTH OF SAMPLE

NOTE

1 SAME AS PART OF LOT 31 BLOCK N SECTION 46 NASSAU COUNTY LAND & TAX MAP

0 20

SCALE IN FEET

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

APPROXIMATE DEPTH OF SOILS WHICH CONTAIN PCB'S IN EXCESS OF 25 PARTS PER MILLION

DATE	REVISED

PREPARED BY:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water Consultants
72 Danbury Road
Wilton, CT 06897
203-762-1207

DATE: 5/22/90

PLATE 2

HRC 001 1277

ND 0.1 NOT DETECTED AT THE STATED DETECTION LIMIT

CONCENTRATION OF AROCLOR (ppm)

2900 (1.1')

DEPTH OF SAMPLE

0 20

SCALE IN FEET

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

APPROXIMATE DEPTH OF SOILS WHICH CONTAIN PCB'S IN EXCESS OF 10 PARTS PER MILLION

DATE	REVISED

PREPARED BY:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water Consultants
72 Danbury Road
Wilton, CT 06897
203-762-1207

DATE: 5/22/90

PLATE 3

HRC 001 1278


LEGEND
↕ = INDICATOR POST GATE VALVE
O = HYDRANT
CU. = COPPER TUBING
C.I. = CAST IRON
STL. = STEEL
L.A. = LOCATION APPROXIMATE
♉ = AIR COMPRESSOR
1 - 3 H.P. VACUUM PLANT, PRESS. LAB
2 - 3 H.P. IN PARALLEL WITH 1
3 - 15 H.P. LATEX & ESTERIFICATION TKS.
4 - 15 H.P. CALENDER
5 - 10 H.P. PILOT PLANT & RESIN PLANT
6 - 1½ H.P. FIRE WATER DRY SYSTEM
7 - 1½ H.P. RUCOAM & ESTERIFICATION INSTRUMENT AIR
8 - 10 H.P. CONNECTED TO #5
9 - 3 H.P.
10 - 5 H.P. EXTRUSION
11 - ½ H.P. ESTERIFICATION INSTR. AIR
12 - 60 H.P. PLANT AIR
13 - 20 H.P. LAB AIR
G - GAS
FW - FIRE PROTECTION WATER 250# C.I. B&S.
UFW - " " " C.I. MECH. JOINT
CW - CITY WATER GALV. STL.
PS - PROCESS SEWER VITRIFIED CLAY TILE
PD - PROCESS DRAINS TRANSITE
UTW - TOWER WATER C.I. MECH. JOINT
TWS - " " SUPPLY TRANSITE
TWR - " " RETURN "
URW - WELL WATER CARBON STL.
UCW - CITY WATER GALV. STEEL
IA - AIR CARBON STL.
MS - STEAM (125#) CARBON STL.
HS - STEAM (175#) CARBON STL.
LC - CONDENSATE CARBON STL.
WW - WELL WATER GALV. STL.
BD - BUILDING DRAINS C.I. B&S.
S - STEAM CARBON STL.
C - CONDENSATE "
OF - OIL FEED "
OR - OIL RETURN "
A - AIR "
AD - ALUM DRAIN PVC
SB - SETTLING BASIN
NOTES:
1 - ALL PIPING SHOWN IS UNDERGROUND EXCEPT AS NOTED.
2 - FOR ELECTRICAL SUPPLY LINES SEE DWG. No. M-60-D-900
3 - FOR LIST OF DRAWINGS SEE DWG. No. B-62-A-100
4 - SEE RUCO/157 FOR 8" CW MAIN DETAIL
5 - ① FOR DETAIL THIS AREA SEE RUCO DWG.
6 - ELECTRICAL SPLICE BOX 27'0" FROM PUMP HOUSE
SUMP
SUMP
COOLING TOWERS
PLANT No. 2
PLANT No. 3
PILOT PLANT
PLANT No. 1
WAREHOUSE
GARAGE
GARAGE
SUMP
SUMP
SUMP
ON OVERHEAD PIPE RACK
ON OVERHEAD PIPE RACK
PROPERTY LINE
R.R. SIDING
N (TRUE)
NOM.
SECTION "A"-"A"
(SCALE: 1½" = 1'-0")
RUBBER CORPORATION OF AMERICA
NEW SOUTH ROAD, HICKSVILLE, L.I., N.Y.
PLANT UTILITIES: OUTDOOR PIPING
SCALE: 1" = 30'-0" & AS NOTED
REV-1 ADD SUMP NOTES 4-5
BY: J.M. CHERRY
DATE 3-19-62
CHECKED: A. HEUER
DWG. No. B-62-0-700

PLATE 4

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

	REMEDIAL ALTERNATIVE	SHORT-TERM EFFECTIVENESS	LONG-TERM EFFECTIVENESS AND PERMANENCE	REDUCTION OF MOBILITY, TOXICITY, OR VOLUME	IMPLEMENTABILITY	COMPLIANCE WITH ARAR'S	PROTECTIVENESS	STATE AND COMMUNITY ACCEPTANCE	PRESENT WORTH COST (DOLLARS)
CATEGORY I	NO ACTION-SECURITY MEASURES AND MONITORING	NO REMEDIAL RESPONSE OBJECTIVES ARE ANTICIPATED TO BE ACHIEVED.	RISKS TO POTENTIAL RECEPTORS REMAINS. PROVIDES CONTINUED MONITORING WHICH WOULD IDENTIFY POTENTIAL RECEPTORS. UNABLE TO INSURE LONG-TERM MAINTENANCE OF SECURITY MEASURES BECAUSE SITE IS CONTROLLED BY COMPANY OTHER THAN OCC.	DOES NOT REDUCE THE MOBILITY, TOXICITY, OR VOLUME OF THE IMPACTED SOILS.	EASILY IMPLEMENTED; ADMINISTRATIVE DEED RESTRICTIONS MAY BE DIFFICULT TO ACQUIRE.	DOES NOT MEET ARAR'S OR TBC ARAR'S.	EXCEPT FOR LIMITING SITE ACCESS, DOES NOT AFFORD PROTECTION OF HUMAN HEALTH OR THE ENVIRONMENT.	TO BE ADDRESSED IN THE PUBLIC COMMENT PERIOD OF THE ROD.	$139,000
CATEGORY II	CONTAINMENT OF SOILS.	MINOR INCREASE TO WORKERS DURING THE INSTALLATION/CONSTRUCTION OF CAPPING. DOES NOT MEET REMEDIAL RESPONSE OBJECTIVES FOR SUMP 3 OR EXCAVCATED SOILS.	EFFECTIVE IN REDUCING DERMAL CONTACT. UNABLE TO INSURE LONG-TERM EFFECTIVENESS BECAUSE SITE IS CONTROLLED BY COMPANY OTHER THAN OCC. AREA TO BE CAPPED IS UNDERLAIN BY UTILITIES WHICH WOULD REQUIRE REPAIR. DOES NOT MEET REMEDIAL RESPONSE OBJECTIVES FOR SUMP 3 OR EXCAVATED SOILS.	WILL REDUCE THE MOBILITY OF SOILS BY CAPPING, BUT DOES NOT REDUCE THE MOBILITY OF THE EXCAVATED SOILS OR SOILS IN SUMP 3 . DOES NOT REDUCE THE TOXICITY OR VOLUME OF THE IMPACTED SOILS.	HIGHLY IMPLEMENTABLE IN THE SPILL AND TRANSPORT RELATED AREA. DEED RESTRICTIONS MAY BE DIFFICULT TO ACQUIRE. ALTERNATIVE HAS BEEN EMPLOYED AT OTHER HAZARDOUS WASTE SITES. DIFFICULT TO PAVE ALREADY EXCAVATED SOILS OR SUMP 3.	COMPLIES WITH ARAR'S AND TBC ARAR'S FOR SPILL AND TRANSPORT RELATED AREAS. DOES NOT COMPLY WITH ARAR'S FOR SUMP 3 OR EXCAVATED SOILS.	PROVIDES SIGNIFICANT REDUCTION IN RISK TO HUMAN HEALTH AND THE ENVIRONMENT IN THE SPILL AND TRANSPORT RELATED AREAS. DOES NOT PROVIDE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT FOR SOILS THAT HAVE BEEN EXCAVATED OR THE SOILS IN SUMP 3.	SAME AS ABOVE	$106,000
CATEGORY III	EXCAVATION OF ALL SOILS TO 25 PPM IN THE 4 OPERABLE UNITS. PAVEMEN[illegible] OF SOILS LESS THAN 25 PPM. LANDFILL EXCAVATED MATERIAL.	INCREASED RISK DUE TO DUST EMISSIONS [illegible] EXCAVATION [illegible] ONSITE [illegible] DESTRUCTION ACTIVITIES. MINOR INCREASE DUE TO CAPPING CONSTRUCTION.	THIS ALTERNATIVE IS EFFECTIVE IN MEETING THE REMEDIAL OBJECTIVES. WOULD REQUIRE DEED RESTRICTIONS SURROUNDING THE SPILL FOR 0.1 KM TO MAINTAIN INDUSTRIAL RESTRICTED STATUS.	THIS ALTERNATIVE WILL REDUCE THE VOLUME OF SOILS AT THE SITE, BUT DOES NOT REDUCE THE TOXICITY OR NET VOLUME. MOBILITY WILL BE REDUCED BY PLACING WASTE IN A SECURE LANDFILL.	HIGHLY IMPLEMENTABLE. ADMINISTRATIVE DEED RESTRICTIONS MAY BE DIFFICULT TO ACQUIRE. ALTERNATIVE HAS BEEN EMPLOYED AT OTHER HAZARDOUS WASTE SITES.	COMPLIES WITH ARAR'S AND TBC ARAR'S.	EXCEPT FOR SHORT-TERM EXPOSURE DURING EXCAVATION, THIS ALTERNATIVE WILL PROVIDE SIGNIFICANT PROTECTION BY REMOVING THE WASTE.	SAME AS ABOVE	$670,000
	EXCAVATION OF ALL SOILS TO 25 PPM IN THE 4 OPERABLE UNITS. CONTAINMENT OF SOILS LESS THAN 25 PPM. LANDFILL EXCAVATED SOILS WITH CONCENTRATIONS BETWEEN 25 AND 500 PPM. OFFSITE THERMAL DESTRUCTION OF SOILS IN EXCESS OF 500 PPM.	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE WITH ADDITIONAL REDUCTION OF TOXICITY, MOBILITY AND VOLUME OF SOILS IN EXCESS OF 500 PPM THROUGH TREATMENT.	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE	$748,000
	EXCAVATION OF ALL SOILS TO 25 PPM IN THE 4 OPERABLE UNITS. CONTAINMENT OF SOILS LESS THAN 25 PPM. ONSITE BIOREMEDIATION OF EXCAVATED MATERIAL.	SAME AS ABOVE ADDITIONAL RISK TO BIOREMEDIAL TECHNICIANS.	SAME AS ABOVE	SUBSTANTIAL REDUCTION OF TOXICITY, MOBILITY AND VOLUME OF SOILS THROUGH TREATMENT.	SAME AS ABOVE BUT WILL REQUIRE PERIODIC INTERRUPTION BECAUSE ALTERNATIVE IS ONLY CAPABLE OF OPERATING DURING THE SUMMER MONTHS. PROVISIONS MUST BE MADE FOR SET-UP OF BIOREACTOR. THIS ALTERNATIVE WILL REQUIRE PILOT TESTING PRIOR TO ACCEPTANCE.	SAME AS ABOVE	EXCEPT FOR SHORT-TERM EXPOSURE DURING EXCAVATION AND PROLONGED EXPOSURE DURING BIOREMEDIATION, ALTERNATIVE WILL PROVIDE SUBSTANTIAL PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT BY TREATING THE WASTE.	SAME AS ABOVE	$1,260,000
	EXCAVATION OF ALL SOILS TO 25 PPM IN THE 4 OPERABLE UNITS. CONTAINMENT OF SOILS LESS THAN 25 PPM. ONSITE BIOREMEDIATION OF EXCAVATED MATERIAL BETWEEN 25 AND 500 PPM. OFFSITE THERMAL DESTRUCTION OF SOILS IN EXCESS OF 500 PPM.	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE WITH ADDITIONAL REDUCTION OF TOXICITY, MOBILITY AND VOLUME OF SOILS IN EXCESS OF 500 PPM THROUGH THERMAL TREATMENT.	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE	$1,319,000
	EXCAVATION OF ALL SOILS TO 25 PPM IN THE 4 OPERABLE UNITS. CONTAINMENT OF SOILS LESS THAN 25 PPM. ONSITE INCINERATION OF EXCAVATED MATERIAL.	INCREASED RISK DUE TO DUST EMISSIONS DURING EXCAVATION AND ONSITE THERMAL DESTRUCTION ACTIVITIES. MINOR INCREASE DUE TO CAPPING CONSTRUCTION.	SAME AS ABOVE	SUBSTANTIAL REDUCTION OF TOXICITY, MOBILITY, AND VOLUME OF THE SOILS THROUGH THERMAL TREATMENT.	ADMINISTRATIVELY DIFFICULT, BUT CONSTRUCTION AND OPERATION ARE EASY AS SYSTEM HAS BEEN EMPLOYED AT OTHER HAZARDOUS WASTE SITES. PROVISIONS MUST BE MADE FOR SET-UP OF THERMAL UNIT AND FOR STORAGE OF THERMALLY TREATED SOILS. THIS ALTERNATIVE WILL REQUIRE PILOT TESTING PRIOR TO ACCEPTANCE.	SAME AS ABOVE	EXCEPT FOR SHORT-TERM EXPOSURE DURING EXCAVATION AND THERMAL ACTIVITIES. THIS ALTERNATIVE WILL PROVIDE SIGNIFICANT PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT BY TREATING THE WASTE.	SAME AS ABOVE	$1,406,000
	EXCAVATION OF ALL SOILS TO 25 PPM IN THE 4 OPERABLE UNITS. CONTAINMENT OF SOILS LESS THAN 25 PPM. OFFSITE INCINERATION OF EXCAVATED MATERIAL.	INCREASED RISK DUE TO DUST EMISSIONS DURING EXCAVATION. MINOR INCREASE DUE TO CAPPING CONSTRUCTION.	SAME AS ABOVE	SAME AS ABOVE	HIGHLY IMPLEMENTABLE. ADMINISTRATIVE DEED RESTRICTIONS MAY BE DIFFICULT TO ACQUIRE. THIS ALTERNATIVE HAS BEEN EMPLOYED AT OTHER HAZARDOUS WASTE SITES.	SAME AS ABOVE	EXCEPT FOR SHORT-TERM EXPOSURE DURING EXCAVATION THIS ALTERNATIVE WILL PROVIDE SIGNIFICANT PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT BY TREATING THE WASTE.	SAME AS ABOVE	$2,190,000
CATEGORY IV	EXCAVATION OF ALL SOILS TO 10 PPM IN THE 4 OPERABLE UNITS. LANDFILL EXCAVATED MATERIAL.	SAME AS ABOVE	THIS ALTERNATIVE WOULD BE HIGHLY EFFECTIVE IN ACHEIVING THE REMEDIAL OBJECTIVES.	THIS ALTERNATIVE WILL REDUCE THE VOLUME OF SOILS AT THE SITE, BUT DOES NOT REDUCE THE TOXICITY OR NET VOLUME. MOBILITY WILL BE REDUCED BY PLACING WASTE IN A SECURE LANDFILL.	HIGHLY IMPLEMENTABLE.	SAME AS ABOVE	EXCEPT FOR SHORT-TERM EXPOSURE DURING EXCAVATION. THIS ALTERNATIVE WILL PROVIDE SIGNIFICANT PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT BY REMOVING THE WASTE.	SAME AS ABOVE	$918,000
	EXCAVATION OF ALL SOILS TO 10 PPM IN THE 4 OPERABLE UNITS. LANDFILL EXCAVATED MATERIAL BETWEEN 10 AND 500 PPM. OFFSITE THERMAL DESTRUCTION OF SOILS IN EXCESS OF 500 PPM.	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE WITH ADDITIONAL REDUCTION OF TOXICITY, MOBILITY AND VOLUME OF SOILS IN EXCESS OF 500 PPM THROUGH THERMAL TREATMENT.	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE	$996,000
	EXCAVATION OF ALL SOILS TO 10 PPM IN THE OPERABLE UNITS. BIOREMEDIATION OF EXCAVATED MATERIAL.	SAME AS ABOVE ADDITIONAL RISK TO BIOREMEDIAL TECHNICIANS.	SAME AS ABOVE	SUBSTANTIAL REDUCTION OF TOXICITY, MOBILITY AND VOLUME OF SOILS THROUGH TREATMENT.	SAME AS ABOVE BUT WILL REQUIRE PERIODIC INTERRUPTIONS BECAUSE THE ALTERNATIVE IS ONLY CAPABLE OF OPERATING DURING THE SUMMER MONTHS. PROVISIONS MUST BE MADE FOR SET-UP OF BIO-REACTORS. THIS ALTERNATIVE WILL REQUIRE PILOT TESTING PRIOR TO ACCEPTANCE.	SAME AS ABOVE	EXCEPT FOR SHORT-TERM EXPOSURE DURING EXCAVATION AND PROLONGED EXPOSURE DURING BIOREMEDIATION. THIS ALTERNATIVE WILL PROVIDE SUBSTANTIAL PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT BY TREATING THE WASTE.	SAME AS ABOVE	$1,726,000
	EXCAVATION OF ALL SOILS TO 10 PPM IN THE 4 OPERABLE UNITS. BIOREMEDIATE EXCAVATED SOILS BETWEEN 10 AND 500 PPM. OFFSITE THERMAL DESTRUCTION OF SOILS IN EXCESS OF 500 PPM.	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE WITH ADDITIONAL REDUCTION OF TOXICITY, MOBILITY AND VOLUME OF SOILS IN EXCESS OF 500 PPM THROUGH THERMAL TREATMENT.	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE	$1,785,000
	EXCAVATION OF ALL SOILS TO 10 PPM IN THE 4 OPERABLE UNITS. ONSITE THERMAL DESTRUCTION OF EXCAVATED SOILS.	INCREASED RISK DUE TO DUST EMISSIONS DURING EXCAVATION AND ONSITE THERMAL DESTRUCTION ACTIVITIES. MINOR INCREASE DUE TO CAPPING CONSTRUCTION.	SAME AS ABOVE	SUBSTANTIAL REDUCTION OF TOXICITY, MOBILITY AND VOLUME OF SOILS THROUGH THERMAL TREATMENT.	ADMINISTRATIVELY DIFFICULT, BUT CONSTRUCTION AND OPERATION IS EASY, AS THE SYSTEM HAS BEEN EMPLOYED AT OTHER HAZARDOUS WASTE SITES. THIS ALTERNATIVE WILL REQUIRE PILOT TESTING PRIOR TO ACCEPTANCE.	SAME AS ABOVE	EXCEPT FOR SHORT-TERM EXPOSURE DURING EXCAVATION AND THERMAL ACTIVITIES. THIS ALTERNATIVE WILL PROVIDE SIGNIFICANT PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT BY TREATING THE WASTE.	SAME AS ABOVE	$1,956,000
	EXCAVATION OF ALL SOILS TO 10 PPM IN THE 4 OPERABLE UNITS. OFFSITE THERMAL DESTRUCTION OF EXCAVATED SOILS.	INCREASED RISK DUE TO DUST EMISSIONS DURING EXCAVATION. MINOR INCREASE DUE TO CAPPING CONSTRUCTION.	SAME AS ABOVE	SAME AS ABOVE	HIGHLY IMPLEMENTABLE USED OFTEN IN CONTROLLED SITUATIONS.	SAME AS ABOVE	EXCEPT FOR SHORT-TERM EXPOSURE DURING EXCAVATION THIS ALTERNATIVE WILL PROVIDE SIGNIFICANT PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT BY TREATING THE WASTE.	SAME AS ABOVE	$3,307,000

TABLE 6-1